

# AVIATION WEEK

A McGRAW-HILL PUBLICATION

SEPT. 26, 1955

50 CENTS



**Another town is safer tonight** because these trained civilian members of the Ground Observer Corps are scanning the skies to warn against possible enemy attack. But all over America there are many areas, perhaps your own, that do not have this protection because the G.O.C. is seriously understaffed. In extending its vital work to all 48 states the Ground Observer Corps needs many thousands of new observers. You'll find the G.O.C. both interesting and exciting! A few hours a week of your spare time will help keep your home and country safe. Volunteer today...contact Civil Defense!

**CONVAIR** A DIVISION OF GENERAL DYNAMICS CORPORATION

Through the assistance of the Ground Observer Corps, the U.S.A.F. Air Defense Command is prepared for any alert with aircraft such as the Convair-built F-102A all-weather supersonic interceptor.





Douglas C-47 Skytrain powered by four 2550 h.p. Pratt & Whitney T-34 turbosuper engines.

## How the Holley "hidden co-pilot" does two jobs with one handle control

Throughout the entire operational range of the new Douglas C-47 Skytrain, engine power and propeller gear are setting must be precisely synchronized. This has always been a "two handle" job but in this new airplane the job is done with a single control lever and the help of a Holley Power Control which functions like a "hidden co-pilot". One of these controls installed on each 2550 horsepower Pratt & Whitney Aircraft T-34 engine automatically varies altitude, air temperature and speed and feeds

the information to the other to assure a series of precision manufactured 2-dimensional curves. These curves continuously interpret this information in terms of engine power which is automatically adjusted through precise metering of fuel by the control.

The Holley Power Control not only synchronizes the engine and propeller for all forward thrust conditions but also controls the vital sequencing of these necessary to reduce the aircraft's banking roll. Designed, developed and manufactured by Holley, the "hidden

**HOLLEY**  
Carburetor Co.  
51732 E. Nine Mile Road  
Van Buren, Michigan

LEADER IN THE DESIGN, DEVELOPMENT AND MANUFACTURE OF AUTOMOTIVE FUEL INJECTION SYSTEMS



Need to save weight and space? Insure reliability? Guarantee fast action? Then consider the talents of pneumatics!

Weight-saving pneumatic systems are smaller, faster, require no return lines whatsoever. Even the heart of a pneumatic system—the compressor—is built in the task of conserving weight and space. You store air until it's needed, building up high-horsepower delivery from a lightweight, low-horsepower source!

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Pneumatic systems are dependable—face no serious leakage problem. The compressor itself automatically compensates for any minor leakage which might occur. Furthermore, since the air used in the system cannot burn, pneumatics free you from the danger of fire!

We here at Kidde have a complete line of pneumatic system components, including high-output compressors, as well as the facilities for engineering complete pneumatic systems. If you have a problem in pneumatics, please write us.

Walter Kidde & Company, Inc., 1015 Main Street, Belleville 6, N. J. • Walter Kidde & Company of Canada, Ltd., Montreal—Toronto

**Kidde**

FOR  
PNEUMATICS

The early Kidde line and products were sold under the name of Walter Kidde & Company, Inc.

# 25th Anniversary of the "Sky Girls"

This year marks the 25th Anniversary of airframe stewardess service, which started back in 1929 when eight stewardesses flying for Boeing Air Transport, a division of United Air Lines, today, United now has over 1000 stewardesses chosen from thousands of applicants and trained at United's school in Cheyenne, Wyoming.

Approximately 10,000 stewardesses are now flying for air lines throughout the world.



## *It's Performance that Counts!*

Long noted for pioneering in aviation, Phillips Petroleum Company continues to perform its part in meeting the very latest demands for highest quality aviation fuels and lubricants.

Phillips is a major supplier of aviation gasoline to United Air Lines, and to other leading air lines who use tremendous quantities of Phillips 115/145 grade aviation gasoline.

Operators know that in aircraft fuels, it's performance that counts. And they also know that Phillips 66 aviation gasoline is outstanding for performance!



W. A. Patterson, President of United Air Lines, with his daughters, Mrs. Charles Bell, and Miss Dorothy Doyle, both stewardesses.



AVIATION PRODUCTS

AVIATION DIVISION  
PHILLIPS PETROLEUM COMPANY  
BARTLESVILLE, OKLAHOMA

SEPTEMBER 26, 1955

# AVIATION WEEK

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# FACTS

about

## NEW DEPARTURE BALL BEARINGS



### Research develops aircraft bearings for extreme speeds and temperatures

With jet aircraft flying higher and faster than ever before, ball bearings are being called on to meet increasingly severe conditions. For example, bearings that support the turbine wheels are subjected currently to temperatures up to 800° F. at high speeds and heavy thrust loads.

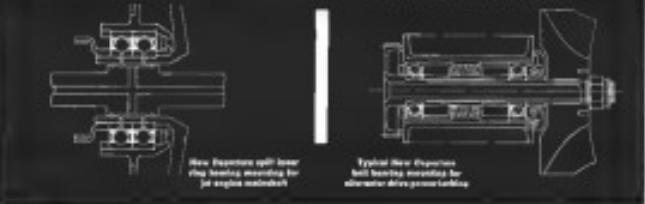
Anticipating still greater demands in the future, New Departure's Aircraft Research Program is already developing bearings for operational speeds of over 180,000 rpm and temperatures rising to 1000° F.

Typical of the bearings used in jet engines are New Departure's split inner ring types. These bearings are giving satisfactory performance in production engines today at extremely high speeds and heavy thrust loads. Write for full details.

**New Departure ultrahigh-speed ball bearings are especially factoring cleaned, separated, and very heavy load levels into the mix. They carry heavy load levels from outer directions and will also support major radial loads.**



### TYPICAL JET AIRCRAFT APPLICATIONS



NEW DEPARTURE • DIVISION OF GENERAL MOTORS • BRISTOL, CONN.

## NEWS DIGEST

### Domestic

Eastern Air Lines plans to announce this week an overall reorganization program for turbine-powered aircraft when a company meeting at New York. Eastern will place big orders for Lockheed's turbo-prop Electra and for the Douglas turboprop DC-8. Lockheed spokesman estimates that Eastern's Electra order will be larger than the 15 plane order placed by American Airlines. Eastern will bar the Allison Model 501 turboprop engine for the Electra, following American's lead in placing a \$12,500,000 order with the engine manufacturer. National Airlines also is interested in Electra DC-8 fleet (AW July 11, p. 100) but has not yet placed firm orders.

Seaboard & Western Airlines and BOAC have entered into an谅解 (no legal agreement) to exchange air freight services over both carriers' routes through the use of each carrier's hub. BOAC recently made a similar agreement with American Airlines for same Atlantic cargo service (AW Sept. 19, p. 102).

Lockheed Electra turboprop transport aircraft and flying boats will be made by Textron Aircraft Corp., Dallas, Tex., for both divisions scheduled for late 1956. Textron will handle design, tooling and fabrication of the components. Electra will approach Textron's first commercial achievement.

Ryan Aeromarine Co., San Diego, Calif., will build structural components for Convair's B-52 intercontinental bomber under a contract totaling more than \$100,000.

Prototype Douglas DC-54 air-sea rescue conversion by Convair Wright has made its initial flight as a prototype in 25 hr. flight check of electronic and special audio and visual equipment. Convair has a USAF contract calling for conversion of 50 C-46s to sea-rescue aircraft.

Fairchild C-119 assault transport has completed accelerated tests not to be preceded of 30th Troop Carrier Group (Convair Wright) at Andrews AFB, Md., during which the plane ran force 150 hr in less than two months. Purpose of trial was to complete C-119 operational data, supply requirements and train flight and ground crews.

Radar training for 1,775 United Air Lines pilots began last month. Convair



### Grumman Produces New Navy Trainer-Transport

Grumman, division of Goodyear Aerospace, has delivered the new T-28, trainer-transport version of Convair's SF-27 aircraft. This new version does not carry the sensitive radio navigation magnetic detector (MDM) because of interference of the metal instrument. A total of 12 T-28s already are in service with Navy. Photo pictured shows aircraft awaiting load, indicating that it is intended to work from bases as well as Navy ships bases.

In Cuban weather mapping equipment includes home-made and classified work. USAF begins evaluation of \$2.7 million in R&D radar this past summer.

Supersonic U.S. S. Skystreak reached speed in the chartered Oct. 1 at the N.Y. Naval Shipyard, Brooklyn, N.Y., for test flight in the U.S. S. Forrestal. Skystreak is slated to be commissioned early next year. Her construction began in December 1952.

Navy and Marine Corps officials already study a 48-seat flight in Lockheed C-130 Hercules turboprop-powered transport at MacDill, Fla., where the plane is to be produced for USAF. The plane is a Martin P5M-2, in the Navy's Assistant Secretary (USA), Lt. Cmdr. G. E. Lamberti, stated and Maj. W. H. Rademacher, USMC, added.

Capt. Harold T. Sutton, USAF, 51, who made an unsuccessful attempt to fly nonstop from Norfolk, Va., to Russia last June in a PV-1B flying boat in 1945, died in San Francisco. He was 63.

Avalon & Minke Systems Laboratories has been dedicated in Sylvan Heights Products, Inc. at Winston-Salem, N.C. New 120,000-square-foot laboratory will attain 700 technicians for research and development in radar, communications, instrumentation and missiles. The latter function previously had been performed at Sylvan's Winston-Salem, N.C., facility.

Colonial C-4 Skymaster three-place amphibian has been granted Type Certificate 11A by Civil Aeronautics Adm. association. Powered by a 175-hp Lycoming 310 radial engine, having a constant speed Hartzell propeller, the C-4 has a top speed of approximately 125 mph. It will sell for about \$16,000 with VHF radio and standard flight panel. Shulie is Colonial Aircraft Corp., Bronx Park, L.I., N.Y.

### Financial

Capital Airlines reports a July net profit of \$312,596 and operating profit of \$318,596. Total operating revenue for the month \$1,573,484. Passenger revenues totaled \$1,281,472. Capital flew 317,066 passengers 71,853,905 passenger-miles in July compared with 223,072 passengers down 70,816,682 passenger miles in July 1954.

### International

New reference center, Midland Air Line, has been formed in Zurich, Switzerland, using Convair C-46s and Lockheed Constellations. The C-46 will be straight from various European ports to Italy where loads will be transferred to Constellations for air shipment abroad.

Jef-Belpius air agreement has been signed permitting Air Liège to fly from Dublin to Brussels and beyond in exchange for Belgian trans-African rights at Brussels Airport. Actions of both countries who are allowed to open direct services between their capitals.

*Today and Tomorrow...*



## CANADAIR COUNTS — in Guided Missiles

Grim herald of the push-button war, the guided missile's development has become an urgent matter for all world powers. The missile itself is not enough... the race is now for sharper control, greater speed, higher altitude, more accurate response.

In the interests of national security, this program is naturally classified but we can say this much: we are working closely with Canadian government research agencies, in the advanced technological fields of design, development and construction of guided missiles. We have produced missile airframes and control equipment... have seen them through actual firing tests.

This is a challenging field, where Canadian engineers face and overcome new problems every day. In missile development, as in other fields of aeronautical achievement, people who know say, "you can count on Canada."



### CANADAIR

AIRCRAFT MANUFACTURERS  
LIMITED, MONTREAL, CANADA



A subsidiary of GENERAL DYNAMICS CORPORATION, New York, N.Y. — Washington, D.C.

canadair

## AVIATION CALENDAR

- Sept. 28-30—Radio Technical Conference for Antennas, Bell Building, Head St., Inc., Washington, D.C.  
 Oct. 3-5—Eleventh National Electronics Conference, Hotel Sherman, Chicago  
 Oct. 4-6—Eleventh annual Aerostar Spark Plug and Ignition Conference sponsored by Champion Spark Plug Co., Hotel Head, Toledo, Ohio  
 Oct. 9-11—National Science Aircraft Assn., eighth annual Meeting and Picnic, Statler-Cadillac Hotel, Detroit  
 Oct. 15-17—National Airport Conference sponsored by American Association of Airport Executives and University of Oklahoma, Norman, Okla.  
 Oct. 15-16—World Photo Fair & Exposition, National Guard Armory, Los Angeles  
 Oct. 17-18—Flight from High Proficiency Award Symposium, sponsored by Institute of Aerospace Research, University of California, Los Angeles, Calif.  
 Oct. 11-14—National Aviation of State Aviation Officials annual convention, Dallas, Texas  
 Oct. 11-15—Sixth of Aerospace Engineers Golden Jubilee Annual Aerospace Meeting, Arnold Engineering Project and Aircraft Engineering Dept., Head St., Inc., Los Angeles  
 Oct. 19-20—Second annual Naval Defense Planning Conference, sponsored by the Washington State Automobile Council and the State College of Washington, Winona Lake, Wash.  
 Oct. 17-21—Sharon John Council, 46th Annual Convention and Exposition, La Sierra University, Hidden Hills, Calif.  
 Oct. 17-21—Lubrication Week, Mr. President Show, U.S.A. general meeting, Midway Airport Hotel, New York  
 Oct. 20-21—Sixth annual National Non-ferrous Symposium, Army Research Foundation, Chicago  
 Oct. 24-25—Joint R&D Meeting, Radio Engineers Group and Electronic Devices, first annual Technical Meeting, Sheraton Hotel, Washington, D.C.  
 Oct. 15-27—Technical Conference on Aircraft Electrical Applications, American Institute of Electrical Engineers, Hollywood Hotel, Los Angeles, Calif.  
 Oct. 26-28—National Airport Manager Assn., annual meeting, Cavalier S.C. Hotel, Atlanta, Ga.  
 Oct. 27-28—Second Electrical Society, 12th annual duplex, Pan Pacific Auditorium, Los Angeles, Calif.  
 Oct. 30-November 1—Tokyo Aviation Day, Tokyo, Japan  
 Oct. 31-Nov. 1—Institute of Radio Engineers, 1955 East Coast Conference on Acoustical and Navigation Electronics, Long Beach Hotel, Long Beach, Calif.  
 Nov. 3-6—Inaugural meeting of International Society of Canadian Aeronautical Engineers, annual annual year meeting, Chateau Laurier, Ottawa, Ont., Canada  
 Nov. 8-10—National Veterans Trade Association convention, Hotel Wentworth Inn, Phoenix, Ariz.  
 Nov. 9-10—Industrial Management Society, 1955 annual meeting, Hotel Marquette, Chicago

AVIATION WEEK, September 26, 1955

## MONOGRAM SHEET METAL CLAMPS **HOLD TIGHT!** —because of this PRECISION CONSTRUCTION



**POWER**—Extremely close tolerances & minimum clearance between the case and plunger insuring smooth movement of plunger in a straight line in all directions which is a necessary feature for smooth operation and long life.

**GEAR**—One piece gear for greater strength. Power parts mean greater durability.

**SPRING**—Of highest quality tempered steel. Manufactured to ready coiled tension that insures an easier to draw the jaws rapidly together and insure positive clamping of all types.

**STAINLESS WASHERS**—Precision made to operate freely in case.

**MATERIAL**—Finest quality steel. Extreme care is taken to hold dimensional tolerances to .0005, assuring a wider service life expectancy. Because of the precision engineering and perfect alignment of all parts, the model clamps are able to tighten and then stamping surfaces ensure the metal simultaneously... imperative for perfect material holding.

**OPERATION**—The quality steel. To insure maximum grip immediately due to smooth, easy rotation and instant expansion of the needles.



MONOGRAM

# MONOGRAM

MANUFACTURING COMPANY

A DIVISION OF AMERICAN PRECISION

EAST Hillcrest Street, Culver City, California

# INDUSTRY OBSERVER

(Editor's note: This column was written by Austin Wren's staff attending the RIAC flying display at Farnborough and visiting the British aircraft industry.)

► **Aero and Standard Rover** reacquisition, pursued by combined helicopter/rocket partners, are scheduled for first flight within next few months. Standard-Rover design will use high-test propane in a decompression cycle. In its initial layout, the plane features a delta wing.

► **Gyro-Jetstar**, new market developed by BAC/Handley as a half-thrust model of its massive Gyro (IAW Sept. 12, p. 27) appears to be a gas-turbine powerplant for production version of some of the present new soaring flight or the driving boards. Suggested thrusts for the 6,000-lb thrust Gyro-Jetstar include the Saab-Jetstar and Avro's reinterpreters.

► Performance of Avro Vulcan has exceeded expectations of contract by substantial margins, approaching some speeds in level flight at extremely high altitude. But Avro designers, who had hoped to push plate into the uppermost speed range, are disappointed. Design is limited by aerodynamics of thick wing. To thus the wing would fit the delta form, implies a complete change of the major sections of the aircraft. Current maximum performance at altitude is apparently limited by availability of elevator control.

► Recent Oxygen-Carbonium altitude record of 65,776 ft. set by Boeing's Walter Gridi (IAW Sept. 12, p. 17) did not show absolute limit of the design. Gridi had a margin of ten hours left between stall and consciousness when he stopped climbing. He landed with approximately 50 gallons of fuel in the tanks.

► Vulcan Vigilant replacement designs still not finalized. Argument now centers around wing location. Some factions in R&A favor high-wing because of passage acceptance of the Elstafighter. Others favor low-wing layout. Vulcan doesn't rise but sagrify needs an immediate decision from R&A.

► Panay FD 2 delta research craft is pointed toward understanding of problems of maneuverability at high altitude and speed. Specific parts of its flight research program will be devoted to study of intercepting supersonic boundaries.

► Gross weight of DH 118 in present pre-production configuration is 35,000 lb. Antennae mast is a gas post of four 90-mm. version. Like the Hawker Hunter, the post can be jettisoned out of the airplane in a snap for fast service and maintenance. External disengagement of mast will be at a suitable launching.

► English Electric P.1, designated as a long-range interceptor, is limited by fuel capacity to the job of target area defense. Development of the aircraft is expected to progress from current powerplant of twin Supersonics through Avon ultimately to a single Gyro.

► Hawker two-stage development is aimed at an all-weather fighter with performance superior—although not by a big enough margin—to the Gloster Javelin. Hawker and official sources act as if they do. Hope it will be taken for a factor. But the plane that was demonstrated at Farnborough had a large protest speech on left-hand side of nose, labeling the nose cooling connection.

► Rolls-Royce vertical takeoff project, not to be confused with the company's "flying bedstead" which is simply a remote test rig, are joint Anglo-American efforts. Rolls philosophy is believed to be based on the use of standard Soviet turbines.

► Rolls-Royce RR 109 turboshaft is now in its fixed engine design modification, and some decking is that the engine as finally built will have little resemblance to the designs that were presented to the aircraft industry about one year ago.

## WHO'S WHERE

### In the Front Office

**Douglas M. Costello**, vice president, standard relatives. *The American War Air Corp.*

**John D. Sulzmann**, vice president Flight Refueling Inc. *Bahrain*

**David Dartling**, vice president and chief engineer. *Whitlock Laboratories Inc.* Great Neck, N.Y. **Frank H. Williams**, director chief engineer. *Cessna*

**Ronald H. Harry E. Temple** (USN Ret.), manager vice president of *Kelvinator Polar Controls Co.*

**Henry R. Horne Jr.**, executive vice president of *Panola Helicopter Corp.* Morristown, Tenn.

**Jack C. Tolson**, vice president of *Hawker Siddeley*.

### Honors and Elections

**Walter L. Ross**, president of *Brewster Corp.* and vice president of *Brewster-Vought Co.* member by proxy of the *Electro-Aerospace Committee* on *Aerospace*. *Roger Woodle* of *MIT Nat Engineering Co.* appointed chairman of the *Instrument Control Institute*. *Mitchell S. Rosen* of *Control Prog* was the appointed chairman of the *Program Planning Committee*, *George Crossen*, R. *Electro-Optical Program Committee*.

### Changes

**Winston J. Chilling**, manager of the problems and standards research dept. at *Lockheed* division of *Illinoian Institute of Technology*.

**William M. Boes**, chief of aircraft and missile systems *Control Engineering Co.* Detroit.

**John F. Neiman**, manager of flight operations department *DC-3 CAE Air Lines*.

**James E. Gage**, assistant administrator manager for Douglas Aircraft Company's Long Beach Division.

**S. B. Bowes Jr.**, chief of operations manager of *Northrop Aircraft's Palmdale Air Force contract*. **Col. Michael W. McRae**, *McDonnell Douglas* aerodynamics manager. **Ray D. Godwin**, project engineer on *air Northrop* long range interceptor.

**Ralph P. Frank**, technical advisor metal industries department *Divinity Corp.*, Chicago. **Donny Mason**, manager engineering section *Special Electronics Div., Sperry-Worrell Inc.* **Carl Johnson**, Mach. Test Assns. engineering staff. **Neil A. Boni**, application engineer space control *Vulcan Inc.*, Denver.

**John Attwells**, manager chief of research and design at *Handford Aircraft Co.* **John G. Vassallo**, *Handford* aircraft sales and marketing manager. **John Attwells** *Handford* manufacturer *Indy* in *Phoenix* Area. Also appointed **Dr. Vugli B. Bellanca**, director of research and development *Fleming G. Shewey*, product planning manager.

**Austine J. Fossner**, New York City director chief manager of *Stork Aircraft*.



**Stuart Hamilton Standard** inventing *Holmstrom* propellers are being furnished for the new **S. Douglas BA-26**, "Seven Seas" aircraft. Years of aviation experience, the highest engineering skills and unprecedent modern facilities in aircraft design problems, and older than *BA-26* of equipment which *Hamilton Standard* is producing for jet and piston-engined aircraft.



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Propeller	#	Blades	#	Air Conditioning Systems	#	Air Control	#	Valves	#	Pumps
<b>HAMILTON STANDARD WINDSOR MODEL CONNECTION</b>										



Left to right, from top to bottom: McDonnell P-181, North American F-100, Convair F-106B, Boeing 747, North American A-10, F-100, and F-104; Lockheed C-130, Douglas DC-9, Sikorsky S-64 and S-65.

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## Washington Roundup

### Airline Hiring Conference

The Eisenhower Administration is trying to end its policy of barring discrimination in hiring for government contract work to the union's allies.

The President's Committee on Government Contracts—headed by Vice President Richard Nixon—is proposing a conference with airline officials to explore federal laws which bar discrimination against minority groups by contractors doing business with the federal government. The industry lobby considers laws preventing such a change as "grossly discriminatory."

Before the committee recommends such action, however, it needs to allow the industry's evaluation of its determination to eliminate hiring bias in airline positions. In the meantime, which has not yet been fully worked out, the committee will explore whether it has no power to prohibit certain of the anti-discrimination clause and that it sets voluntary targets.

The contract committee approved the size of a contract dispute also causing complaints from the Urban League in New York that Negroes were barred from jobs in plants, flight engineers and stewardesses. At present, a committee sub-panel's "handful" of Negroes have been hired to ticket sellers and in maintenance work but that, it is general, Negroes do not hold senior jobs that are in contact with the public.

The committee is also part of a series of federal executive actions on hiring discrimination in the entire transportation industry. Initial plans are to meet separately with industry and union leaders to explore the committee's purpose, prior to action that will extend anti-discrimination clause to transportation contracts.

All government contracts of \$10,000 and over, except in anti-discrimination hiring clause, with the federal contracting agency authorized to cancel the contract with violators. However, this enforcement power has not been used by the Eisenhower Administration.

Purpose of the Nixon committee is to rule laid as these agencies, preparing complaints of violation and to seek compliance through the agency and the contract awarding authority. But, before extending the clause to transportation industries, the group wants to explore this. The Administration is doing so and the results it hopes to achieve.

### All Flights IFR?

All weather practice at traffic control or 100% Instrument Flight Rules is again underpinning issue of getting flying offshoots from air law pilot group. Oberon project that air line management will soon be faced with pilot demands to make it a ratio of company pilots to 100 seats under IFR in high density areas.

The Pilot's Master Director Council at one of the major trade shows has gone on record with a resolution favoring implementation 100% IFR air traffic control at New York, Chicago and Washington, D. C. Conditions being or notwithstanding such action included:

- The viability factor to today's air routes merit is about 5%.
- The cockpit-to-ground distance rate of some of today's aircraft is now greater than the speed of a 45 mph Gide automatic judge.

- The regulation of air traffic has reached the position where the New York control alone, in one 24 hour period last spring, cleared 4,000 individual IFR aircraft

\* The aviation industry will never be strong enough not to be moved by the blow it would receive from the public's reaction to a needless media inflation over some major city.

### Air Power Debate

The air superiority issue still is being raised back and forth in Washington and seems certain to stay there long enough for what Sen Stuart Symington (D-Mo.) fears USASecretary, perhaps will be a "defensive program." Most recent flurry was caused by a committee's claim that the Killeen Committee report, now on the hands of the White House and the National Security Council, was wrong in naming the strategic weapons race and will be in the first Senate 1965. The report brought a passage statutorily from President Eisenhower's press secretary that it was "incorrect," adding that the President does not believe that just because the report is wrong that it will dictate what goes in the report, if any, will be released to the public. Symington's insistence on demand that the Defense Department tell the people the truth, including he would pass legislation to find out "why there is a current effort to further health, safety and defense expenditures while the Congress is not in session."

### Progress Payments

Defense Department's proposed revision of the progress payments clause of government contracts will get close attention in Washington this week from Accounting and Contracting Committee of Aircraft Industries Assn.

Feature of the revision is to limit progress payments to 75% of total costs and 95% of the value of direct labor and materials. In addition, it is designed to ensure that the government has title to all parts, materials, components, tools in progress, held, etc. This is intended to help prevent manufacturers fight local efforts in no capital equipment and inventory that do not represent company ownership.

The limit on payments has been in effect for several months. The proposed revision, intended to reflect the Defense Department's request, will stand in due course. The Progress Assn. has asked for comments not later than Oct. 10.

### \$80 to Seattle?

Sen. Warren Magnuson (D-Wash.), from his key position as chairman of the Senate Commerce Committee is campaigning for the use law to coach fares on the Pacific Northwest as applicable to transcontinental service to California. \$160 round trip. His committee has scheduled hearings on the matter for Oct. 26 October, 26, 1965, and Sen. Charles Padden (R-Pa.) also expects to attend.

Northeast Airlines is considering expansion and possibly reduced fares, for round trips to the Pacific Northwest, but fairly within the same range as the \$160 fare. "Let's not let ourselves," Northwest Airlines spokesman said, "the traffic in the Pacific Northwest is only about 90% of that in California." Civil Aeronautics Board members have had meetings with Northwest and United Air Lines officials about reducing round trips to Seattle and Portland, but there were no concrete discussions.

—Washington staff

## Gardner Defends Greater R&D Spending

**Pushes request for \$200-million more now to keep pace with Russian guided-missile gains.**

By William Coughlin

**L**os Angeles—Trevor Gardner, USAF Assistant Secretary for Research and Development, last week vigorously defended the additional \$700 million he wants from Congress despite administration pressure for a balanced budget.

Gardner also argued that "hundreds of millions of dollars" will be needed if the U.S. is to keep pace with the Soviet Union in the guided missile field.

Speaking before the full meeting of the American Rocket Society and plainly at the session talk of re-thrust in defense arrangements, Gardner admitted that Soviet support must be reckoned with in the budget. That is correct.

"The most complex and baffling technological venture today is not the Russian capability to assault and nuclear weapons but either what the Soviet project has been in the field of guided missiles."

"This causes people a great deal of concern, and it makes us see we have to have huge sums of money for guided missiles."

The double-edged warning was one of the most significant code words uttered by administration officials late in the beginning of Russia's "missile

dash" plan. And he went one step further by telling the delegates to the meeting:

"As a responsible officer of your government in charge of your Air Force research and development program—I wish to assure you that it is not the intention of this administration to lose our technological lead over Russia in order to收支 balance the budget."

"We all know," he added, "that it is necessary to keep a balance, but we need \$700 million more now to work on the problems I have not been talking about. (The problems he did not talk about were those of guided missile complexity and reliability.) He concluded:

### Willfulness to Exploit

"We must be willing to expend an increasingly larger amount of our national resources—but dollars and technological effort—in our efforts in the development of guided missiles."

The analysis, in addition to affirming this, additional hundreds of millions of dollars for research and development."

Gardner thus renewed a plea for increased R&D spending which he made less than a month ago at the Air Force Academy meeting in San Francisco.

It is not generally known that Gard-

### Kimball and the Pentagon

**L**os Angeles—Dick Kimball, president of North Central Corp. and former Secretary of the American Rocket Society, has working last week informed some of the difficulties of doing business with the Russians:

• "You take so much time there that you get little commercial contracts."

• "The time to get a contract is ten times as long."

• "We make one-half the profit."

• "You get reprimanded, reprimised and re-scolded around until you walk away never to see the place."

so temperated his San Francisco speech considerably only a few hours before it was to be delivered after he learned that Donald A. Quade had been appointed Secretary of the Air Force by the administration.

Kimball said at the time that Gardner had planned a brief statement of present R&D short but changed his speech. The last sentence was this: "Admiral Radford, Defense Dept. research and Quade, Defense Dept. research and development, was named to the top Air Force post."

To his talk last week, Gardner declined.

"They made an excellent choice in selecting an outstanding man as Secretary of the Air Force Quade."

### Quade's Stand

And that is exactly what is more discernible about the new secretary than any statement made by Secretary Quade (AW Sept. 19, p. 230) who told a panel of reporters on the Columbia Broadcasting System network television show that, "We should not then draw our program to build up a new wisdom and effort in space."

Quade indicated that defense spending might be cut in war critical areas to help administrative efficiency balance the budget but emphasized he would oppose any cuts that might hamper the military's power accelerated weighty program.

Art Secretary Gardner left little doubt that attempts to cut defense spending would also thin, here's fire from his office but he also touched upon one of the greatest differences in making a fight when he emphatically declared:

"Those of us who are charged with

## Douglas Weapons System Policy

**L**os Angeles—The philosophy of Douglas Aircraft Co. as applied to the guided missile field was outlined last week before the American Rocket Society by Donald Douglas Jr., vice president of the company.

He and the Douglas Co. believe the role of the defense manufacturer should be that of "wholesaler" of the weapon systems and loads of the nation.

"We will strive that some of the leading weapon companies have some responsibility for guidance and propulsive fields," Douglas said. "They believe, naturally, that these advantages to be gained by this. We happen to believe it is better to leave such work to companies whose experience and facilities have quality than to do it."

The Douglas executive said that cooperation with suppliers or potential suppliers cuts off the free fire of alienation that is involved in working out the best possible shares of the various defense contracts.

"In the first place," he said, "the work of the guidance system specialists is absolutely basic. We at Douglas believe that best results are obtained by working with them, instead of trying to hire them out. American engineers are hard to be satisfied, also, but we have seen them beat at the hands of manufacturing firms."

"As to the production of weapons, we believe that is manufacturing activity. It is best to let others do whatever phase of the job they are best qualified with."

the management of the national research and missile industry are necessarily caught in the dilemma of attempting, on the one hand, to report to you on the progress we are making while in setting your tax dollars and, on the other hand, of avoiding the bad and early reporting might give to our potential customers. It is like looking for a gun leak with a searchlight."

### Adm. Radford Warns Red Air Gains Starling

The speed with which Soviet Russia has developed long range jet bombers forces the American government to reassess its strategic and operational capabilities of our forces," in the opinion of Admiral Arthur Radford, chairman of the Joint Chiefs of Staff.

Addressing an Atlantic City meeting of the National Petroleum Areas, Admiral Radford declared that Soviet scientific technological and production skills in the military field have removed the curtain from the position of a war endemic power that it held during World War II.

After the war, he said, the United States remained while the Russians "began a six year lead of ours in—principally a technological race to perfect supersonic weapons." This is rapidly at possible, they began taking out some systems as important quantity.

These developments, Admiral Radford said, have resulted in a total center for the United States and "our whole future depends on winning."

The top scientist, adding to the White House statement, stressed going to a "very heavy investment of their available scientific and technical staff." He and they have been remarkable in squaring their resources to achieve superb power.

Of major significance, he said, is the stress given to young young. Considerable attention is given to scientific, engineering and well educated scientists here as far as the United States.

"Our technological leadership in these major fields is being seriously challenged," Admiral Radford said. "We have lost the lead in scientific and technological importance, but we are nevertheless still be whittled away unless we correct these many faults."

The United States still is ahead of Russia, he said, but the conclusion is apparent that jet engines in serviceable condition are becoming only, without extensive thought, better suited to a production basis," he said.

The Navy is pushing gas turbine engine development for helicopters on a clear approach, independent of specific application to a given model.

In other words, "One will, rather

## At Helicopter Forum

### Gas Turbine Monopoly Predicted

**L**os Angeles—New gas turbine engines under intense development are achieving a monopoly of the helicopter field within a few years, industry and industry experts predicted last week.

Reports on these new engines highlighted the biennial Western Forum of the American Helicopter Society.

Designer Butch Loring is developing an XTS1 gas turbine for helicopter use under a Navy program. The latest report indicates the new drive is in advanced stages of development. The XTS1 is rated at 510 hp (AW Sept. 19, p. 231).

The Licensing XTS1, designated for the Air Force and Army, is rated at 650 hp twice that of the XTS1. Butch is reported to be close to completion of the XTS1 for a road wing assault.

Orville R. Rose of the U.S. Navy Helicopter Section said the Navy has been forced to re-evaluate requirements demanded the use of gas turbines engines in combat systems.

"No reciprocating engine development of major importance is planned to meet these requirements," he said. "The last major feature of engine development is the development of aircraft gas turbines, which is planned to helicopter and will be in all areas except those involving no engine developed for both fixed and rotary wing applications."

He reported that the Navy's development plans center around the General Electric XTS1 engine.

### Ground Turbine Drives

New interest is centered in ground turbine drives. Various configurations of jet drives such as the Allison T56-A-1 and compressor engine are being pursued on a research and development basis only, without extensive thought being given to a production basis," he said.

The Navy is pushing gas turbine engine development for helicopters on a clear approach, independent of specific application to a given model.

In other words, "One will, rather than determine the requirements of a given type of helicopter and then develop an engine to meet the need, effort shall be devoted to developing an engine to conform to a particular requirement of the propulsive power spectrum." This spectrum for the helicopter gas turbine should extend from 1,500 to 4,000 shaft horsepower, he declared.

Comparing this power spectrum with the gas turbine engines generally used in aircraft development, namely the T53, T55 and the T56, it is noted that a com-

petitive gap occurs between 300 horsepower and T51 output, and between the T55 and 3,600 horsepower." Then and "We believe that these gaps demand will be filled."

D. D. Wadsworth of the Army Transportation Society said it appears that for the majority of helicopter applications the free turbine type engines offer the greatest potential. But, he added, the Army believes that as long as the general requirement of being able to fly with a minimum of maintenance is met, "it does not make any difference in the type of engine, whether it is a reciprocating engine or turbine, so far as being at least as safe other types."

Wadsworth said a major part of the Army power plant development program is devoted to improving existing turbine engines. He listed projects to elevate spark plug flying, increase turbine life, improve vibration of rotors and air and improve piston ring combustion.

Among new developments, he mentioned investigation of the principles of exhaust ejection cooling, hot fuel preheating development for cold starts, fuel injection, automatic controller heat, automatic reverse gear for the carburetor and new oil filter media.

### Turbine Interruptions

D. C. Beloy of General Electric and gas turbines offer these advantages: light weight, fuel conservation comparable to reciprocating engines, lower fuel cost, reduced vibration, lower maintenance and improved reliability.

Charles H. Zimmerman of Naval Advisory Committee for Aviation reported on experiments indicating that jet engines in serviceable condition are becoming only, without extensive thought, better suited to a production basis," he said.

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**TWELVE SUPER SABRES** of the 479th Fighter Day Wing, 4th USAF Tactical Air Command unit to receive the supersonic fighter, begin to roll off production lines on May 1st. (Boeing photo)

faults following the NACA development made it possible for the plane to achieve its performance.

Would performance in that case, if asked, be judged before or after the test rate improvement was incorporated in the design?

Another strategic manufacturer pointed out that defense schedules, upon which USAF will place greater emphasis, can be upset by such vagueness as the failure of CTAR areas (government furnished strength requirements) to arrive on schedule. During these delays, USAF itself sometimes endures changes due to conditions that have been anticipated.

The problem has come at a point now in production where the engine is furnished by the government. After the aircraft was on the factory line, USAF changed engines employing a power unit that weighs 800 lb more than the one that was called for in the original design.

This company also feels that the new USAF policy of eliminating design studies and sounding counters that go through Phase I to a small number of prime firms, is too restrictive.

Other industry representatives are pressing themselves in favor of shorter deadlines from USAF but were skeptical of statements that competition will be enhanced by exact procurement policy changes.

The Aircraft Industries Association declared:

### Defense to Limit Contractor Payments

Defense Department on Oct. 1 will formalize payment of more than 105% of the costs incurred on incentive-type and gross revenue-type contracts prior to negotiation of a fiscal year.

Defense direction 14105.71 says the purpose is to "clarify the cost of substantial refunds by contractors after subcontractor final determinations of price."

Actually, the purpose is viewed by Pentagon observers as twofold:

- To step the practice of compensation

that reflect more than three products is worth and invent the extra money paying the government's price determination.

• To help balance the budget, as part of the Defense Department's effort to save more than \$750 million from its estimated 1966 expenditures.

There also was a report that the Pentagon is working on a program to speed up price reiterations.

The new Defense directive calls for a 105% limitation clause to be written into all new contracts. In addition, continuing efforts are to ensure the payments within that amount in re-inventorying existing contracts.

### Russia Views X-1A

Russia's popular press has finally recognized the existence of high-speed American experimental aircraft, but, to date, one of the planes is reported to have been shot down in recent years. At an annual Zvezda-5th (Knowledge is Strength) scientific, political and aerospace Congress for young Soviet intellectual workers, recently published a picture of the Bell X-1A with the following caption:

"The experimental Bell X-1A rocket plane has achieved a speed of 2,059 kilometers per hour in a dive. This is more than twice the speed of sound. The result has attained a maximum altitude of 17 kilometers."

"However, the Bell X-1A is unable to take off from the ground by itself. It is caused to a great height by a special airplane. There the rocket plane is launched and then it starts, burning up its entire fuel supply in several minutes."

It should be noted that the aircraft set under such conditions isn't unguided by remote."

(Editor's note: The Bell X-1A actually achieved the speed of 2,056 kilometers—3,690 mph—in a climb, not a dive as reported by Zvezda-5.)



**NORTH AMERICAN F-100** heads into steep climb (above).



**WHILE PULLING** others into supersonic speeds over desert.

## TAC Flexes New Super Sabre Muscle



**TWO LONG ROWS** of F-100 Super Sabres stand along fuel assembly line at North American Aviation's Los Angeles plant. The second TAC unit to receive the plane is the 490th Fighter Day Wing, of Turner AFB, Tex.

## 'No Show' Penalty Fee Dropped For Domestic Coach Passengers

Washington—The domestic scheduled airlines have killed the "no show" penalty fee on air coach services. It was a unanimous action by the Air Traffic Conference last month with no lectures for "competitive reasons" on the part of a majority group of carriers.

Abandoning the air coach no show penalty fee was in a direct continuation of the efforts to develop a "no show" penalty fee for first class air services (AVW Aug. 22, p. 11).

The decision to drop the fee plan for air coach passengers holding their

tickets who either fail to show or cancel too late to recall the ticket was first caused by a majority of the carrier members of the Air Traffic Conference, and later made unanimous. The action is formally effective Oct. 2. Set the necessary tariff changes filed with the Civil Aeronautics Board do not take effect until Oct. 15.

The "no show" penalty plan initially imposed a charge of 20% of the air coach fare with a maximum charge of \$1. It was designed as a corrective measure for the continued abuse

of the airline reservation system. A proposal last October by a minority of carriers to cut that figure had been widely considered. Initially, at the center to agree on a single, uniform plan for assessing penalties has precluded implementation of an industry program.

L. R. Smith, American Airlines' president, summed up the situation with the statement: "Experience clearly indicates that no single carrier or minority group of carriers can effectively operate a system designed to discourage abuse of the reservation system if all other carriers refuse to do so."

American has been a vigorous proponent of the use of such charges as a means to encourage the responsible use of "no shows" and their cancellation. Once the ATC voted to cancel penalties in route service, Smith urged that the decision in a letter to CAB stating that American's argument "is due its respective force".

Smith observed that "the continuing abuse of the reservation system by the public is primarily the fault and responsibility of the air lines... for the existing system which permits and at times inadvertently encourages abuse of the reservation system is one devised by the air carriers and continues with their support." He said that a publicly supported no show plan should be a prime reservation procedure as an essential element of the public service the airlines are expected to provide.

Smith told the Board he felt that there should be no distinction in regional reservation policy as between the air coach passenger and the first class passenger. He argued those who advocated abolishing the penalty system for air coach of acting against the public interest. Rather, it would be in the public interest to impose a like action on first class services Smith said.

### Douglas Shifts

Group 2, Gelly, Douglas Aircraft Washington representative for the past eight years and assistant secretary in ranking to the general offices in Santa Monica, Calif., where he is scheduled to be shortly thereafter by the company.

L. F. Tellechea, now corporate senior safety and division of technology, has been appointed as the Washington vice-president.

Edwin Curtis, former assistant director of contracts, has been named director of contracts.

J. E. H. Hargrave, of the Douglas Washington office, has been assigned assistant project engineer on the DC-10 jet transport. His replacement is S. W. Colbaker who was formerly with the tire tire division staff located at the Santa Monica headquarters.

### New Propeller For Supersonic Flight

Hawker-Siddeley's new nose-mounted, free-bladed turbo-hydromechanical propeller designed to operate through the subsonic and supersonic speed ranges, will be used on the Panavia Tornado 222 fighter-bomber variant which will replace the English C-117 transport.

The propeller design is efficient in the difficult high-speed flight regime through the use of different blade designs.

Principal feature of the new propeller is the method of mounting. Ad vantage includes

- Relieves engine of all propeller induced bending moments. The engine shaft therefore rotates only, does not support the propeller.
- Allows substantial reduction in overall engine-propeller weight.
- Propeller pitch change and control actions are integrated within the propeller assembly.
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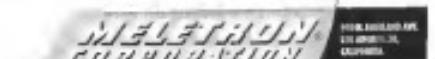
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# AERONAUTICAL ENGINEERING

## 'Satelloid' Debut, Soviet Delegates Highlight Astronautical Congress

The significant concepts emerged from the recent Sixth Congress of the International Astronautical Federation in Copenhagen. One—the proposal for a satellite known as a "satelloid"—showed some unusual design. The satellite would be built in the Soviet Union and sent instead to a cooperative production plant in France.

In the following article, Soviet Aerospace delegate to the Congress—Frederick L. Drury III, Howard E. Carter, Jr., and Norman V. Peterson—discuss the Congress in both its technical and political aspects. Mr. Drury, with the Guided Missiles Division of Republic Aviation Corp., is a director of the American Astronautical Society and editor of the Journal of Astronautics. Mr. Carter, a member of the Engineering Division of Bell System Corp., is also a director of the AMS and associate editor of the Journal of Astronautics. Mr. Peterson, with Space Dynamics Co., is president of the AMS and a member of its editorial board.

Delegates from 20 nations, including Soviet Russia, gathered in Copenhagen for the Sixth International Astronautical Congress, which also included a Russian delegation (represented by a memorandum of U.S. plans to place small, unmanned satellites in orbit during the coming International Geophysical Year [July 1957–December 1958]).

The memorandum helped set the tone of the meeting, which produced two new-and-significant concepts. A new satellite called a "satelloid" and another Russian gesture of lively interest in the general satellite undertaking.

The satelloid, proposed by Mr. Kostik Blenke of Comsat, is a hybrid and unusual satellite-build approach. Half satellite frame and rocket motor boost to a greater than day altitude, while it is a true "spaceplane" that will only return in the low 100-kilometer orbit of the original IGY satellite proposal. Unlike the first two satellites, the satelloid is to be maneuverable, powerful, reusable, and able to gradually land back to Earth with its occupants intact. Although the flight vehicle is currently working on the orbiter vehicle proposal, the propellants are estimated to resemble a molten (perhaps plasma) winged airplane; it would rely on a mere 3,000 lbs of propellants stored in small tanks to maneuver at average speed of 17,000 lbs per second about the earth.

The planned orbit (200-180 miles) is quoted as approximately 100 miles off the earth. Measurements of the orbital velocity are very large relative to the mean orbital velocity of the earth. The mean orbital velocity of the earth is approximately 10,000 miles per hour, while the orbital velocity of the satelloid would be approximately 17,000 miles per hour. This means that the orbital velocity of the satelloid is 70 percent greater than the orbital velocity of the earth.

A competition for the orbital orbiter was scheduled for the fall of 1974 but it was not known whether it took place. Last year was the Soviet Academy of Sciences (which directs all scientific research in the USSR) took over and formed a "Permanent Interplanetary Scientific Committee on Interplanetary Communications."

A most interesting idea is whether the European announcement will create a similar committee.

Officially, it was announced—without exception—with pessimism for the International Geophysical Year.

Conversely, the United States seemed to "lead the way" on Russia, believed to have been prepared to make a similar announcement of its own.

Curiously, it is possible that the long-enthusiastically-voiced Russian opposition group the outcome at a series of indicating general interviews while Big Four talks were in progress in Geneva.

### Russia Research

Some reports of the Congress quoted as the possibility that flying saucers may be Russian satellite vehicles.

Although this is highly unlikely, it is certain that the USSR is currently working on the orbiter vehicle proposal. The last official post-satellite organization interested in space flight was the Astronautics Section of the Chkalov Auto Club.

Missions were held each last year to discuss the concept to assist it to possible objectives and to form five broad-based committees. The fields of responsibility were Astronautics and related physics, rocket technology in transportation, navigation, human biology and medicine, and radio control of interplanetary flight.

A competition for the orbital orbiter was scheduled for the fall of 1974 but it was not known whether it took place. Last year was the Soviet Academy of Sciences (which directs all scientific research in the USSR) took over and formed a "Permanent Interplanetary Scientific Committee on Interplanetary Communications."

Head of the Committee was Prof. Peter I. Kapton, atomic scientist and nuclear expert. Other key men in elated V. A. Andrianov, astrophysicist and chairman of the Astronautics Academy of Sciences; P. P. Peresetskiy, astronomer; and B. V. Kukarin, astro-physicist. Announcement of the new committee's existence was made last April.

Russian satellite vehicle plans appear more ambitious than their counterparts in the United States. They have been classified as "interplanetary research laboratories." There have even been paper-faced environments by impossible Russian scientists listing it as manned flights to the moon.

### Secrets of Copenhagen

Three Soviet observers showed up at the Copenhagen Congress: Lazar Titov, member of the Moscow Academy of Sciences and president of the Provincial Interdisciplinary Committee on Interplanetary Communications; Kostik Blenkevich Ogranichenko, professor of physics and astronomy at the University of Kazan; and Nikolai Slobodkin, engineer.

Solar system, the International Astronautical Federation (IAF) was a far reaches for international cooperation but still the final decision as to Russia's participation would be up to Moscow. He seemed to feel however that Russia would cooperate with the American satellite program. Similar thoughts were relayed elsewhere by Committee panel chief Nikolai Krasheninov, suggesting that the "Gagarin spirit" has entered into the realm of international with a bang.

After the aforementioned meeting of the Congress had been opened and the opening speech made with Mr. Drury's highly technical paper on the orbited satellite, Gherman Titov on the channel closed vehicles concluded.

\* Paul Aleksandrov Bond (Bob) spoke on an "Artificial Satellite Orbit Stability Using Systems," a technique for maintaining a satellite in a circular orbit around the earth. This involved a pattern of gravitational waveguiding forces whose direction is perpendicular to the line joining the earth's center of gravity to that of the satellite. The moment of the force is proportional to the deflection angle, or the initial value of the angular velocity of the satellite and that of the orbit.

\* Methods of determining the apparent wave-fields of simple satellite configurations as influenced by the gravity field and motion of the satellite itself were discussed by Norman Peterson (SRA). In his paper, he estimated lifetimes of satellites from near

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PINE BOATS SINCE 1955

smoothly, swimming, splashed, and caused body shape. Patients gave an approximate solution of the differential equation for the spatial case of reflectors reflecting off molecular film. This or examination of several examinations he demonstrated that fibrosis, damage, damage, usually with fibrosis, and increase rate.

• R. T. Sawyer (USA) approached the general problem of ground observation of artificial satellites. A white, 21-inch spherical body-flying reflector seemed to have value as the brightness source of the satellite. He calculated the rate of change of the re-entering optimum velocity at a reentry angle of 70 degrees as an smooth approach to the sun. Forney and Hines know exactly where to look, the satellite, when reentry depth exceeded at 200 miles altitude, will first be visible to 7500 kilometers when the sun is 2 degrees below the horizon. For solar dispersion angles greater than 9 degrees, reflected eye visibility will remain as long as the satellite is visible. For any dispersion, the sun should be 5 or more degrees below the horizon.

+ Capt. Giacomo Panniti (Italy), discussed problems of rocket and satellite design. elegant consideration of the problem led him to conclude that improved, logical attitude guidance could be well served by only one axis. Advantages would be less vibration in thinner atmosphere and accurate earth-gravity effect. He also thought it possible that the satellite could be established by launching a V-2 stage inside a Boeing skin from a vertical position at altitudes up to 60,000 feet.

• Fred Ordway III and Raymond Curran Jr. (USA) presented the results of an extensive 120-page survey on the utility of the satellite vehicle. They concluded that the satellite vehicle could be most advantageously used near every major field of scientific inquiry, but notably in atmospheric gas-phase measurements, planetary findings and occultations. With the exception of reconnaissance, the satellite value of the satellite was regarded as dubious. In unanticipated terrestrial deep-space flight, its use was considered as unreliable unless some fundamental improvement appears in propellants.

### Space Biology and Physics

As might be expected, the papers at this date involved many of the several biological aspects of space exploration. Dr. John F. Keeler reported on the present status of such research. He showed that certain cells have produced definite effects on muscle fiber, heart, plate counts and eggs of rotifers. Definite genetic effects were noted in all but the rats whose only star births were observed. These photo of horses did not include granules which later changed to pigmented

spores—about six months.

Prof. S. T. Singer (USA) at a time when of concern over effect on matter at high altitude showed that the physical effects on both materials and biological matter can be separated into atomic and molecular effects. While the biological effects have been the subject of intensive study except in the case of latent processes, this was the first meeting of nuclear effects. Singer showed that while they are small, they are considerable. He gave numerical values and discussed a method by which the biological effects could be properly gauged.

Singer suggested that the atomic transmutations which are produced by atomic size and initial total energy and frequency. He showed that in order to obtain effects, nuclear effects are not

the greatest whether cosmic ray ionization would cause the atom's projected surface (in atmosphere) to become radioactive making similar as plutonium dangerous to man. Being the dose, not think so. He discussed the shielding problem against heavy protons and said that hydrogen absorption is the most efficient as a weight loss, especially as a fragmentation shield.

Dr. F. A. Hillsborough (USA) explored the physiology of space. Hillsborough showed that physiological and primitive effects of 61,000 feet are equivalent to those experienced in a complete vacuum. From there on up scaled on variations would be necessary.

### Manned Flight

He reported that people at Ohio State University were studying this problem. While simple air-conditioning systems for sealed cabin have already been developed, Mr. Hillsborough felt that isolated sections (inner walls, etc.) plastic) needed more study. He described tests made on animals in various conditions.

At about 30 min. of vacuum, two body swelling effects occur. The first is due to simple expansion of intestinal gases. The second is apparently due to the leaking of blood and other body fluids. An expansion of two minutes is more or less certainly fatal.

Hillsborough noted the chief problems of manned flight into space as sleeplessness, zero gravity, acceleration, heating, noise and vibration, disorientation and weightlessness. There are serious but they can be overcome.

Two other papers on this general subject were presented. One by Seaman and Stoner (USA) on the effects of protein particles on balloon house spores, the other on corporalism, now from the Sea, by Mr. G. F. Andriens (Denmark).

These papers by Balles delegates, Prof Antonio Eche, Renato Prinsuza

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- *Reduce manpower!*
- *Cut time on ground!*

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## Plans for the U. S. I.G.Y. Program

Agency	Vehicle	Number of Vehicles	Place of Flying
AFCRL	Aerobee	8	Cape Canaveral, Florida
AFCRL	Aerobee	7	New Mexico
AFCRL	Balloon-Dragon	4	Cape Canaveral, Florida
NRL	Aerobee	17	Cape Canaveral, Florida
NRL	Balloon	5	New Mexico
NRL	Reactor	48	Pacific off San Diego
SCIL	Aerobee	5	Cape Canaveral, Florida
SAC	Reactor	49	Arctic
SAC	Rocket	49	Antarctic

### AGENCY CODES:

AFCRL Air Force Cambridge Research Center, Boston, Mass.  
NRL Naval Research Laboratory, Washington 25, D. C.  
SCIL Signal Corps Engineering Laboratories, Ft. Monmouth, N. J.  
SAC University of Iowa, Iowa City, Iowa

### NOTE:

The listing scheduled for Cape Canaveral will, of course, be subject to the approval of the Canadian Government.

and Prof. George Clemence, invited various experts of private industry. Dr. J. M. Knut of Bellard presented some calculations on a long range rocket. Vertically launched, the rocket division would reduce to the horizontal aspect of flight, its own orientation parallel to the orbital plane by the operation of an attitude pilot.

Dr. Jack Ladd (England) considered the optimum launching of a fast payload ground into a 200-mile orbit. From the standpoint of payload, the most economical trajectory would, however, focus on the equatorial plane. Dr. Georges de Vaucouleurs (U.S.A.) suggested that the chief way to serve at a compromise between the demands of fuel consumption and air resistance. The spherical, insect-like vehicles appears to be right.

### Definite Plans

The United States and France already have announced definite plans to make rockets in connection with the International Geophysical Year. England and Australia are considering similar programs, but it is not known whether they will proceed.

Dr. H. W. Newell (NASA) discussed the role of rockets in the I.G.Y. and listed some observations which could not be made from the surface of the Earth.

• Measurement of solar ultraviolet and X-ray which do not reach the Earth.

• Measurement of low-energy cosmic rays.

• Measurement of the chemical and ion composition of the upper atmosphere.

• Detection and measurement of small particles.

- Measurement of ionospheric electron density.
- Measurement of the earth's magnetic field at high altitudes.

Other uses noted were measurement of temperature, pressure and density distributions in the atmosphere, winds, ionospheric charge densities, bright and dimmings of sunlight and auroral conditions. He outlined the meeting American plan for the I.G.Y. which applies to other vehicles.

### Space Flight Problems

If H. W. Newell (NASA) diagnosed a three-year spectrum of programs consisting of five flights 4 to 7 years each in length. The program breaks down, approximately as follows:

- 1964-1965 Unmanned satellites.
- 1965-1966 Cargo and passenger satellite.

• 1966-1969 Experimental space stations.

• 1971-1977 Fully-crewed space stations.

• 1975-1985 Expeditions to Mars.

This could be accomplished for about \$11 billion a year, he said.

Along the same general line of space flight planning, Donald Rumsen (USA) suggested an organization of the various science which get to make up the over all body of astronomical science. The form would be analogous to that for the over all body of astronomical science.

Profiled with synclines, for example, he suggested "orbital routes" covering the general behavior of celestial objects in interplanetary space. The source of information would form a "hub" for integrating the effects of various other astronomical agencies and scientists to develop truly synoptic studies and suitable performance.



## Introducing 245 Pounds of Sheer Flying Magic!

Turn on the "Gismo"—and you'll be hearing plenty about this wacky performer.

Designed, built and flown by Goodyear Aerospace, it's just two weeks' elapsed time—the way we prove to be the ultimate, one man helicopter needed by the armed forces for counterfiltration, rescue and a variety of medical work.

The simplicity of its design can be seen at a glance, but feature that if you can.

It weighs a mere 245 pounds including battery and stores, can be packed in a box 21" x 22" x 15", purchased in a kit and assembled in minutes.

It will fly 45 minutes on 3½ gallons of gas, has a top speed of 50 mph, cruises easily at 25 m.p.h.—has an estimated service ceiling of 12,000 ft.

It performs every manner of helicopter magic, including rolling pull-ups, hovering and pattern flight.

Its auto-rotation qualities are spectacular—slingshot its belly and power comes from its commandingly available water-cooled 2-cycle outboard engine, and the Gismo descends at one-half the conventional rate for a 'copter.

Here is panache, simplicity, performance and safety—in one of the easiest engineering packages of the year. It's a good example of the resourceful way Goodyear Aerospace serves the nation's defense effort, one of its many roles as a versatile team mate to the aerospace industry.

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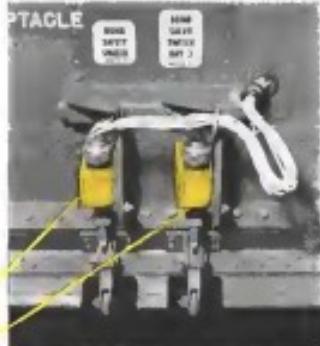
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Used to indicate certain functions. Standard ratings: 10 amp 125 volt ac/dc.

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Hermetically sealed switch designed for fuel tank transfer switch applications. Standard ratings: 10 amp 125 volt ac/dc.

### Turret Switch

Hermetically sealed switch designed for hermetically sealed switch applications. Standard ratings: 10 amp 125 volt ac/dc.

## Civil Charter Parts To be Studied by CAB

Washington—The Civil Aeronautics Board will seek to begin hearings that could help American charter operators better plan and for worldwide management of fleet, commercial crews of passenger groups and rates.

The letter of the charter industry in the United States is directed to be the first hearings on requests for civil charter exchange in the Airlines Association Transport Association and the Independent Airline Transportation Association (ACTA) and IMATA should open exchange for military charters.

In the 17-month period ending Sept. 15, 1958, the 16 member firms of ACTA and IMATA had some 115,170 sorties performed in cargo and charter passenger flights and 37,600 charter passenger trips. Military charter were arranged through the Associations' exchanges. Civilian traffic was handled through the facilities of the individual airlines.

Additional charter service negotiated through the ACTA exchange has increased from a 1954 dollar volume of \$127,800 to \$40 million thus far in 1958.

ACTA's independent charter exchange could be run on a "multiple channel" basis in several groups of passengers or cargo contingencies constituting its plan. ACTA, however, would probably be unable to attract too great a group of passengers to an exchange organization due to the philosophical bent of the administrative difficulties of the multiple charter system.

Both exchanges would sent only basic file organizations regarding transportation. Charter closing dates would be problemal from dealing with radar agents, although this could cause problems from freight forwarders.

Officials of both organizations are optimistic concerning CAB approval, bringing their hopes in these five days to a close.

Board's favorable preliminary decision however Paul Pfeiffer favored the carriage for a "whatever" trial period (AW July 4 p. 78).

Planned cuts in Defense Department costs. Reduction of coal and natural gas bills would also save money through stem tips, lowering the price for each customer.

More economical road routes. A short charter system would give the wheel industry a firm economic foundation.

• Study of two exchanges would further lower charter costs.

• Senate Recommendation. In 1953,



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Wide-wide implementation of Narco DME (Distance Measuring Equipment) is now underway by Mohawk Airlines serving New York City and New England.

First encounters have been completed as Mohawk's new fleet of Convair 580s with the DME installations scheduled to follow in the company's use DC-3s.

Implementation of Narco DME is the third major step made by the first use by a scheduled airline of this latest navigation aid which gives the pilot exact distance information from a VOR or DME unit.

The Narco DME gives this information in two miles — or 20 miles for class in approach work and 800 miles for enroute navigation.

Use of DME by Mohawk is expected to offer considerable economies by preventing expected RVR approaches.



### DME Network in Wide Operation

DME coverage on all major airways plus secondary or lay-by areas of enroute and terminal areas. CAB has issued a general order commanding operation of the system throughout the nation. CAB has recently announced new procedures using DME which eliminate much of the time-consuming procedures now necessary.

### Executive Pilot Prefers DME



E. E. Mason, Executive Pilot for T. P. Davis, President and Chairman for Astro Design and Engineering Co., a division of the Astro Corporation, has flown 700 hours with Narco DME during the past year and a quarter.

"I wouldn't want to be without it," is Mr. Mason's summation of DME. "For instance, you're flying into Washington, DME makes it much easier to land."

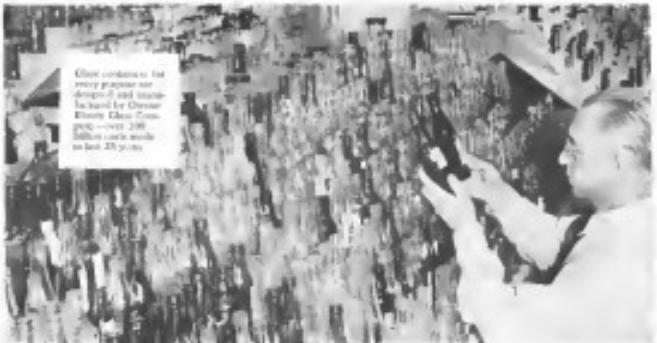
"Expected improvements on instruments are another big advantage of DME. Because we can set the mode exactly where we are, we often get greater performance from instruments." VTR

DME allows us to make the maximum approaches in safety, as the weather permits, just as though they had ILS."

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positive Paper and Kodalith Film gives engineers fast service... saves dollars every day. Choices are you can adapt this technique to your own routines.



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**New design is added to the Autopositive, which is then processed in the laboratory.** The original drawing is placed on the Kodalith Paper, and the new drawing is placed on top of it. Redrafting involves a sheet of clear plastic — each copy and uniform — provides direct illumination, which can also be used. Less cost, less time, less drafting.

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a Senate Small Business Committee approves a mutual charter exchange.

A recent nationwide survey of chart brokers by IMAFA reported that brokers of all sizes in an exchange would receive from 100 to 1,000 passengers per year, an average. Incidentally, the potential charter market (AW Feb. 7, p. 94).

The market is made up of three principal groups:

- Convention travelers. Organizers delegate world travel plans far in advance of a plane's 10 to 15 months, then to bus, railroad, airway, inland.

- Exhibitors for trade shows. Transportation of a company's equipment is often postponed until the last minute when only a chartered plane can get it to its destination on time.

- Production managers. Emergency flights often necessitate early arrangements for voice production equipment in order to avoid plane shot down.

- Fleeter owners. Availability of fast transportation on short notice determines profit and loss for such groups.

- College and professional athletic teams, theatrical groups and officials or superstars from occasionally required flights on short notice.

The foreign charter market has not usually responded to a regular exchange for the last eight years. London's British Air Transport Authority does grant authority to international operators to charter flights. These are not太 common in France and Germany with interests similar to the British.

Since 50 principal United Kingdom and foreign operators are represented on the Exchange, which is worldwide in its scope, foreign charterers who have done previously by charter in the category equivalent to our certified airlines include: Canadian Aircraft Corp., British European Airways, Swissair, Belgian Air Lines, KLM Royal Dutch Airlines, Air France and Air India, among others of the charter field.

Interest because of the exchange was stimulated also by the shortage of available long distance, high-speed, transports (AW Dec. 7, '58, p. 21). With the increased availability of these aircraft, the number of charter flights have dropped appreciably.

Laws exist, however, in but one of the advantages should shippers and organizers of passenger planes. Speed of operation of global airways and area routes also have restricted business to the exchange.

Airline exchange facilities have indicated that passenger flights constitute a greater percentage of foreign charter flights than ever before. During a recent week, it ran higher than 60% of the total charter market on the exchange.



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## Cutlass Joins Fleet



...Delayed  
But Not  
Stayed



SEVEN YEARS after the production of its prototype, the Grumman Cutlass finally joined the Navy in an operational unit. Squadron VF 114, equipped with 14 F7Fs, boarded the carrier USS Hancock (above and left) for round-trip duty to the Far East. The F7Fs were slow in reaching the fleet because of delays in engine development.

These weather items prepared in consultation with the United States Weather Bureau

# TERRAIN

**TWO VARIETIES** of mountain ridges have a significant effect on the air masses moving over them—with a consequent effect on the weather and plane performance.

One of the most spectacular effects of ridges on air currents is the Mountain Wave—a high-speed deflection of the wind when a ridge of hills blocks a steady flow of air. This sets up a "wave" which may reach high altitudes and extend in a chain of waves for several hundred miles downstream. The Lenticular-Type Standing Wave Cloud identifies these large waves. Even small ridges may cause air waves and produce strong down-drafts on the lee side (see diagram at right).

One should be alert to approaching a ridge across the wind, because in a low-powered plane the down-draft may make it impossible to maintain enough altitude to clear the top. Also, when taking off on a runway toward a hill, be prepared for a decreased rate of climb if the wind is coming over the hill.

When flying in the vicinity of mountain tops, the possibility of damage exists a factor. Two primary factors can cause damage to aircraft: higher altitude shear-area, lowered pressure caused by disturbed flow on the lee side and extremely cold temperatures. Combined, they can produce erosion in excess of 1000 feet.



## Best Pair to Get You There!



Flying over rough terrain, steady air currents and sudden downbursts can call for even quick engine response. Here's where knowing on the right fuels and lubricants can pay off.

Mobilgas Aircraft and MobilOil Aero are aviation's toughest tests... entered rigid Army and Navy specifications... deliver full power and performance when you need it most. *Get ready to fly with the Flying Red Horse!*

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OPERATIONAL FLIGHT TRAINER for the McDonnell F2H-2 fighter. Student's cockpit is at left; instructor's station at right.



## Navy's Special Devices Center; Better Training, Less Expense

By Harry Laier

KODIAK POINT, L. I., N. Y.—The Naval Proving Grounds, one of the oldest Naval Research bases, has one of the Navy's best weapons in the struggle to keep up with the increasing complexity of modern aircraft.

The attack goes on along many fronts, but for the West Point MDC's approach to develop training equipment to permit pilots and crews to learn a good part of their jobs on the ground without bring up expensive aircraft, and without being hampered by limiting factors such as weather. Special Devices Center is also responsible for the provision and control of logistic and material support for training equipment.

The center's projects include operational flight trainers (Air Force calls them flight simulators), precision trainers, hybrid trainers and associated ground stations. It has worked out simplified cockpit instrument presentations. SDG psychologists are delving into human engineering aspects of flight crew training and maintenance. SDG engineers have developed various types of helicopter computers.

Special Devices Center is under the office of Naval Research. By more than 500 personnel under Capt. C. H. S. Morrison, its ranks include civilians. The civilian complement includes about 40 from Naval Air Arm, Participating Corps and Air Force liaison officers. SDG is the designated agency for appropriate Army research concerning the need for a separate Army organization of this type. One recent development for Army is the NACA's operational flight training

divisions are made up of a number of branches.

Of special aviation significance are some of the projects of Engineering Directorate's Aviation division, in which the remainder of this article is devoted.

The Aviation division consists of:

- Operational flight trainers
- Aviation liaison
- Air applications
- Computer

In charge of these four branches is John H. Hilde, reporting to Capt. Hilde.

### Operational Flight Trainers

This branch produces OFTs and precision trainers.

• Operational flight trainers are designed to simulate all flight problems from takeoff to landing, including simulated malfunctions and other difficulties. None will substitute for the



F-11F-1 COMBAT FLIGHT SIMULATOR offers three-point view of flight and maneuverability to result from real mission flights for intercept studies.

**NOW... from a foremost manufacturer** **of Aviation Metal Hose—**

*Lightweight* **Titeflex** flexible hose...

made from Du Pont Teflon®



Titeflex knows the aviation hose business — has been making flexible aircraft metal hose for over 20 years. And now... to keep pace with the requirements of the jet engine industry, Titeflex has developed a new type of flexible hose with an inner core made from DuPont Teflon tetrafluoroethylene resin.

Our Engineering and Research departments with their specialized experience in hose manufacture, working with all types of metals, now adding special resins, have designed, developed and tested a new

product to complement our complete line of metal hose. This is not just a Teflon liner core with wire braid covering, but a completely engineered product from fittings to carefully selected braid and materials.

Working with the designers and engineers of leading jet engine manufacturers, we have developed a flexible hose that meets all practical requirements of MIL-H-5511 specification under independent testing by a leading research laboratory.



**Resistance to Chemicals.** New Titeflex hose is impervious to the corrosive action of synthetic lubricants, hydraulic fluids, salts, solvents, acids, bases, alcohols, ketones, esters, and other organic compounds. It will not change in any way affected by temperature.



**Resistance to Heat.** New Titeflex hose withstands temperatures up to 300°F. Does not soften, deteriorate or change in any way under high heat torture.



**Resistance to Cold.** New Titeflex hose retains its flexibility even at -190°F. Resists embrittlement with no cracks, deep or shallow. Freezes at 0°F but does not plug.



**Tensile Testing.** Sample Titeflex hose fails at 100% elongation at approximately 10,000 psi. Strength is determined by stretching the hose until it breaks.



**Hydrostatic Testing.** Sample Titeflex hose fails at 100% elongation at approximately 10,000 psi. Strength is determined by stretching the hose until it breaks.

### Chief Characteristics

- Has high resistance to synthetic lubricants, hydraulic fluids
- Withstands extremely low temperatures
- Operates at extremely high temperatures and pressures
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- Will not crack, chip; will not cause hoses to plug
- Has indefinite shelf life
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**Customer Service.** Titeflex sales engineers are company-trained specialists. They work directly with you to help you find the right answer to your aviation hose problems. Call us there, without obligation, at any time.



**Quality Control.** This is a view of the Titeflex quality control laboratory where new materials and other components are subjected to extensive testing to determine their suitability for Titeflex products.



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### A "DESERT ICEBOX" IS ONLY EXPEDIENT

This traveler finds relief in the desert sun, thanks to an expedient "desert cooler": towels draped around bottles in a shallow pan of water. Capillary action keeps the towels moist and a few degrees cooler than the ambient temperature. Here's a more effective cooling in its simplest form.

## FOR ENGINEERED ELECTRONIC COOLING PACKAGES... LOOK TO UAP!

The temperatures of electronic equipment must be bracketed and tightly controlled. Miniaturization of modern electronic equipment has made it impossible to maintain operating temperatures by natural convection and radiation. UAP engineers have designed complete cooling packages which maintain the proper temperature range of electronic equipment while in operation. These packages can be installed remote from the equipment, or the electronic components can be automatically mounted within the cooling package envelope. They are designed for shipboard, ground equipment and aircraft installations. UAP cooling packages employ liquid-to-liquid, air-to-liquid and air-to-HD heat exchangers and uses MIL-E-5490 and MIL-E-3275A spares.

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actual aircraft are also displayed. About the only factor of flying that is missing is the effect of Gs, which has proven difficult to duplicate.

Generalized trainers are used to give instruction in navigation, landing and instrument procedures, but do not simulate landing or takeoff conditions. There are about 10 OATs in the field, with another 25 or 30 in the works.

One of the OATs is anywhere from a standard fighter like the McDonnell F3H-2 to a seat for Minuteman missile stages, the PSM, with stations for the entire crew of six. The PSM carries amounts of fire retardant, one containing the flight seats later and the other the tactics module, to provide training in the plastic substructure surface erosion.

SDC's original idea of an OAT is to fit inside a standard aircraft fuselage. This incorporation has caused some re-education to start as cockpit areas are shifted. The trainers are equipped with cargo holds so that they can be stored aboard assault carriers if the Navy decides to make such a move. This would permit carrier crews to maintain flight proficiency amidst the clock regulation of weather. "The Carrier test" would also make it feasible to install or remove the simulator in a carrier switch-horn type aircraft without difficulty.

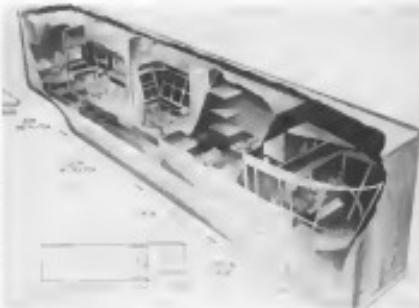
The trainers are self-contained, except for the power supply. A typical trainer employs capacity for 10 hours of an average mission, including fuel, gear and tools to keep equipment serviceable without notable operating losses.

Development of an operational flight trainer is no easy model. A typical fighter manufacturer can acquire 30,000 engineering man hours and perhaps 40-50,000 production man hours. A A. Black of the OAT team told Aviation Week: "The OAT for the PSM required between 350,000 and 175,000 engineering man hours, with an additional 70,000 man hours for its associated tactics trainer."

As each OAT project the contractor only builds the first prototype and then cuts the requirements down to basic line-pole modules for building production units.

An OAT is designed for a specific type of plane (F3H, for instance) and generally for a specific model (F3H-2) because of the complexity and high cost of a typical trainer (\$1 million). SDC has embarked on a number of programs. For example, one OATs are being built so the cockpit can be removed and hooked up to a normal trainer. In this way, a single flight trainer can be used in conjunction with a variety of different types of experimental flight trainers.

The OAT boards are also perfect for



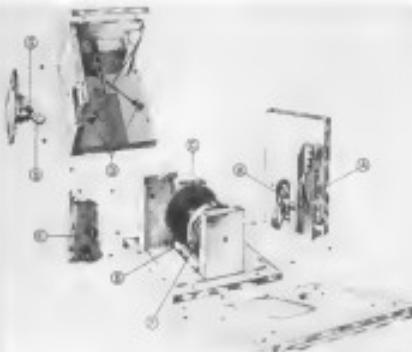
**TABLE AIRCRAFT TRAINER** was converted from a Link trainer. Like other trainers and simulators developed by Special Devices Center, it is built as a trailer.

program to standardize components and designs used in the various contractors' developments. In addition, the contractors will maintain certain standards of space required, and unit weight (one metric ton) to reduce costs in shipping, installing and carrying equipment in the aircraft.

A typical electronic unit has about weight cut to 15 kg from 91 when transportation units used in place of tubes.

Another problem the OAT team is studying involves maintainability and maintainability. Contractors' engineers are now free to design their own circuits from 10 watts to 1 watt.

Another problem the OAT team is studying involves maintainability and maintainability. Contractors' engineers are now free to design their own circuits



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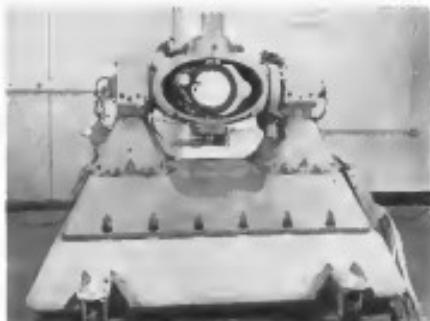


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THREE-DIMENSIONAL FLIGHT TABLE developed by SDC's Computer Branch is used to test behavior of missile control systems. It will take a 50th order element.



LARGE ANALOG COMPUTER built modular into three-dimensional flight table.

and techniques for networking, switching, security as long as the End users meet SDC requirements. In developing standardized techniques, OCF personnel hope to reduce acquisition and spares requirements. The OCF has converted a number of standardized, obsolescent plates to newer state-of-the-art designs, thus saving a large amount of expensive labor involved in redesign of complex circuitry. A typical conversion takes from 14 to 15 man-hours.

Generalized, however, are also concerned to see measures to no obvious measure. Rivers said module training for the ZSC-II analog and digital computers.

These are forecasts. Look, however, with confidence changed to represent new factors and events. Headline "now" to the paper gods.

The situation. Present research is responsible generally for all training

devices which do not come under the OCF branch. Many of these include procedure trainers and simulated panel training aids.

• Procedure trainers are comparatively inexpensive devices designed for specific procedures, such as cockpit familiarization, navigation, fire emergencies, etc. Although the cockpit is an exact replica of a specific plane, as it is in the open bond flight trainers, many of the instruments are dummy. Only those involved in the actual procedure to be taught are operative.

A recent forecast, the ZSC-II hydroturbine power plant simulation, developed for SDC, Inc., Bell Bantam Company (AW Aug. 28, p. 9) is reported to give the equivalent of 50 hours of practice flight instruction. It will be established at the Navy Flight School, Pensacola, Fla.

The student sits in the Z-711-1 cockpit

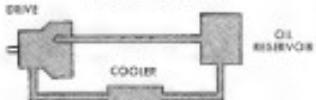


Douglas A-4D SKYHAWK 1945 LOWWEIGHT GENERAL ELECTRIC CONSTANT SPEED DRIVE

## How G-E constant speed drive's unique design improves Bantam A-bomber performance

The unique ball piston design of the General Electric 9-KVA hydraulic constant speed drive improves the performance of the Douglas A-4D Skyhawk by providing a space reliable drive of reduced weight and size. The simplicity and symmetry of the few moving parts also permit the drive to run "full of oil" in a completely oil-filled system.

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World War II "Liberator" had gun turrets powered with GE servodrive, directed and fired manually. Today, newest TAC bomber B-58 has GE fire control system which is radar directed by remote control.

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First American turboshaft engine built by GE had 2150 hp. Today, smaller, more efficient gas turbines provide better power-to-weight ratio for helicopter and other aircraft applications.

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GE supervised new development of V-2 rocket, shown above in first launching from U.S. aircraft carrier. Today, advanced GE design rockets like the RV-A-10 provide new data on large solid propellant rocket motors for use on guided missiles.

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jet, which is a replica of the Bell HTF-2 cockpit transparent, while a perspective range of the terrain is projected on a hemispherical screen below the jet. Actually the images from two projectors form a horizon ring showing upward horizon conditions and a basic horizon road, striking an intense positive image of light and colored terrain transparencies are blended to produce a realistic composite image for the trainee.

Pick-off potentiometers mounted on the standard HMT controls provide basic inputs to a speech processor, an analog computer which solves the dynamic equations of motion in real time and scales output commands to six servo drives associated with the projector and the various actuators, vibration damper and wave generator in the cockpit.

The project light and transparency are suspended together by a gamut ratio for each call and view of the whole picture, simulating for the pilot the actual appearance of the horizon and horizon as he moves various controls in the flight.

While the JTHO has proved useful in training fighter pilots, a primary reason for its development was to test the system refined through the above experience and the good service of both.

What it makes you as a member  
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Another approach to the problem of subjective flight simulation is being studied by SDG's Air Applications branch. Here a constant model of the terrain is built and viewed as a solid image matrix connected through appropriate optics to the human eye. An enlarged PTV image of the terrain is projected as a horizontal surface in front of the cockpit. The pilot "flies" the projection as if it were the real thing.

Special Devices Center is also working on helicopter ground procedures for the Fim-92 Stinger and Sidewinder H-141A Army

A recently completed project is the  
passenger plane built by Canadian  
Corp for the Grumman F11F-1 Tropic  
Navy fighter.

When first revealed by Aviation Week (Mar. 28, p. 14), the seat was known as the F-104's "pilot's cradle" but the designation of the plane has since been changed. A later development is the award of a contract to Lufth Aviation for a Tigre optimization flight test.

H. R. Flores, project engineer on the Tiger procedure bracket, says the cooperation of Gummus and the instrument manufacturers during design and construction of the unit, helped

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Loop development time to a minimum. Flown on a typical propeller, it would cost only \$50,000, compared to approximately 20 times that figure for a specialist.

It is hoped eventually to supply squadrons with propellers mounted well ahead of the delivery of new-model aircraft and considerably before the long lead time OEMs require to build.

\*Automated panels or Naval air warfare trainers or SDC with them, take the pilot or operator or aerial warfare systems, and are designed to or intended to assist in the operation of various systems.

The NAME panels, presented by SDC, consist of logic logic working schematics of various plane systems. Some seven ones use colored lights to indicate the sequence of operations when a system is activated. The panels fold up into individual portable carry cases, so they can be transported from base to base and set up quickly, if a test is required.

The sys var is complete with the aircraft. Arthur Brown, who worked on the RAV-8 Super Counterboard, says, "in a month, 14 presentations, including two of the flight control systems, aircraft fuel system, and a fly-by-wire fuel feed, fuel injection, oil, cooling, heating and venting, and pressurization."

One RAV-8 set is going to Patuxent Naval Air Station, another to USAF at Holloman AFB, New Mexico.

Among the contractors building NAME's for Special Devices Centers and Technical Training Units, Lockheed Aircraft Service, Janes Helicopter Control, Aircraft Technical Training Units, recently delivered to USAF, the first flight-tested maneuver trainer.

They were for the Douglas AGM-3 (DC-3) and are used with Marine Air Transport Service in California, Florida and Massachusetts. An earlier TTA mounted panel utilized the Convair 580 described in *Aerospace Week* Nov. 30, 1953, p. 85.

#### Air Applications

The Air Applications branch has developed practically all of Navy's aerial training devices. Personnel of this branch have been working on simplified simulation displays for some years now. As long ago as 1949, Major American flight test pilot, W. E. Shute, had worked out a proposed display unit to be used in the Douglas X-3. The X-3 flew in 1950 (AV Jan. 20, 1950, p. 99). Then the X-3 display was in the cash and carried through to completion. In later half dozen a ground leadership and landing indicator which rotates as the cockpit shelf turns. The intention

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# Aviation Week Buyers' Guide

An Annual Publishing Service  
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ISSUE NUMBER 2010 NOVEMBER 28, 1955

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- **KEY** To The Major Buying Influences In The Multi-Billion Dollar Aviation Market

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ning personnel—men who make up aviation's real buying influences... in the industry itself, in the Air Force, and throughout the Government.

The latest developments in military procurement will be covered in a special report included in the detailed information to be presented will be: Air Materiel Command—Air Research and Development Command buying practices; personnel ratings by name, procurement centers, and All-inclusive listing of manufacturers of transportation and allied products, reconditioned for maximum safety under six major headings: Aircraft Engines and components, Armament, Tool Equipment, Landing Gear, Powerplant Motors, Airframe and components, Equipment, including ground-handling, Powerplant, Avionics, Communications system and equipment, Radar-for control systems and equipment, Instrumentation and controls, Navigation systems and equipment, Computers and devices, Test equipment, Computers and data processing equipment in airborne, ground-based or shipboard applications. Supporting Groups: Data systems, Electrical, Ground equip-

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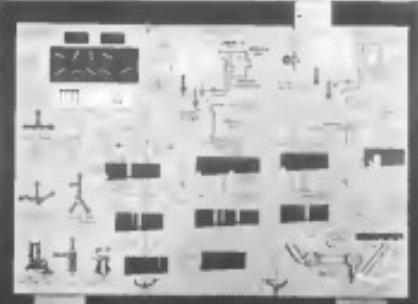
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**ANIMATED PANELS** are used for flight operation of various aircraft systems. This flight system panel is one of a set prepared for the B-58H aircraft (BSC-6).

place on the upper part of the center section depicts the F-106's maneuvering during actual airplane dynamics.

Aero Applications has developed a computerized cockpitimulator which records G and roll deflections at all three axis and shows the results on a cathode-ray display.

The recorder is triggered by an IGG impulse, operating twice, takes full load and self test each second up to 250G. Several Navy squadrons, flying jet and piston aircraft, are equipped with the device. Other four have been provided to USAF, NASA, flight Safety Foundation, Air Force's School of Aviation Medicine, and various organizations for safety studies.

Knowledge of G forces and their effects on aviators, aircraft and equipment designers bring valuable information for developing easier-to-pilot aircraft. Aeronautical engineers who have been involved in the New York Air Force Base trials of various pilots have reduced operational losses in a variety of emergency situations.

The Aero Applications branch is developing various research tools to investigate physiological problems of flight. A recent project is the human disorientation device for aerospace disorientation devices for flight training and live fire in flight.

More of this group's projects are the result of a team effort using both Viking engineers and experts. The polar star is clear; the human engineer works out the theoretical solutions and the engineer translates into practical form. The team's designs lead to construction of hardware for the flight simulator, and final return measurement to the Air Force.

The heat and heat of sea open-

ings are mixed, the opening and flight characteristics of the plane. As the controller feeds problems into the simulator and the pilot and crew react, the computers analyze the situation in microseconds with respect to the plane's position, pressure and determine the conditions of the flight.

The company's Computer Research leader, Francis J. Doherty, is responsible for the design of these computers. This branch is also responsible for the development of a number of automated computers, several of which have been built by private companies. Among these are the Cockpit analog computer, built and operated by Bausch, the Typhoon analog computer built by RCA and one at Navy's Johnsville Division, the Hurricane digital computer, or integrated data system which can be programmed to gather data from such loads as Raytheon and an operator in Ft. Monmouth, and the digital Whirlwind, located at Massachusetts Institute of Technology, which built it. The Whirlwind is being used for development of aviation components.

These computers are invaluable in private design for problem solving. A typical problem may take from two to eight months to work out, but the computers we keep on a fresh hot schedule.

An important new development of the computer branch is an ultrahigh speed digital computer, believed to be the fastest of its type in the world. Design work is nearly completed and serial construction should begin early next year. The new computer could bring great economies in time and money.

A disadvantage of digital computers in

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**Bendix**

the part has been their compensation distance. Whereas analog computers have been able to do an optimization process at conditions permitting them use in real time problems, digital generally must perform a step-by-step scanning process, so that output legs the input in an opposite sense (Unison, the electronic "beam" which was used in one of the radio-TV sets works to move the mesh during the last Pritchard iteration, is a digital unit).

However, by ingenious design, the Computer Branch's new digital computer can be programmed for all practical purposes. Programming is a one-plane characterization of much character learned. Log between datum of the aircraft and the test DFT usually runs well over a year.

With the new unit, analog computers could be built on a semi-production basis and used in the short term model. After the new approach to programming work for the computer unit is done, it is a fix situation. The same computer design could be used for many different planes and tank boats with only the programming and codelet installation changed in the computer wordlist.

Also a particular DFT could be changed from one type of assault to another in a matter of hours instead of the months now required. This feature together with the position of designating flight commander to the codelet administrator is such a feature that would greatly increase DFT flexibility.

A three-dimensional flight table developed in the Computer Branch is being used to test guided missile warhead systems and other components. Florida has been operating the unit for about a year at Brevard for B-6000. Another unit is being built for USAF to be in staff at Holloman AFB.

At present the table is limited to problems where rotation around the axis is less than a right turn. However, with addition of slip rings, the table will permit unlimited rotation.

The flight table is designed to be used in conjunction with a large gun patch, such as the Triplex or Cycloidalizing unitary munitions.

The codelet editor is mounted in a special holder on the table and desired "environment" conditions are programmed into the computer. These are also fed to the table and behavior of the user element studied. The table will accommodate elements up to

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50 lbs in weight and 5 in diameter. Performance parameters designed into the tube for aircraft are unpreceded outside performance, according to Jack R. Bennett, project engineer. Velocity capabilities are up to 80,000 ft second, with 10 lb load, one, 15 mil/sec, unloaded pitch, 12 mil/sec, unloaded. Acceleration capabilities are up to 7,000 and over/sec, with representative load vars, 900 mil/sec/sec, unloaded, pitch, 500 mil/sec/sec, unloaded.

Dynamic response at off is 125 microseconds or less, 50 cps, in pitch. 51 cps. Pitchhead accuracy is within 0.2 degrees.

#### PRODUCTION BRIEFING

► **Hawk Manufacturing Co.**, 2150 Berkmar Ave., Elkhart, Ind., announced the expansion of their West Coast facilities through three exclusive West Coast representatives, Milton A. Mosey and Associates. The new building containing 7,000 sq. ft. of floor space will provide facilities for sales staff, order department, warehouse and general management. New address will be 123 Arbor Vista, Highland, Calif.

► **International Casting Institute** announced the completion of a Sales and Nat'l. Profit Survey by the certified public accounting firm of Seach and Dunn. The survey shows that average 1944 sales for the companies reporting amounted to \$977,951. 1945 volume is expected to reach \$125,000,000. Copies of the consolidated sales and profit reports are available from the International Casting Institute, 271 Monroe St., Chicago, at a cost of \$10 per copy.

► **Long Beach Scientific Instrument Co.**, Solana Beach, Calif., has started a research and development laboratory at an initial cost of \$180,000. New division of research will be Dr. Charles G. McLeanhead, aided by Dr. John B. Braxton.

► **Long Beach, W. Va.** silicon plant of Laclede As Products Co., a division of Union Carbide and Carbon Corp., is scheduled to start production this fall. Steel buildings have already been completed and about 300 people will be employed by the end of 1945.

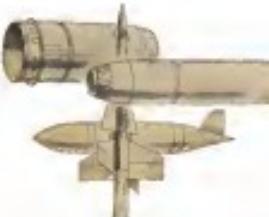
► **Hired Products, Inc.**, has installed a new purchased line to produce aluminum boronite sheet, up to four feet wide. To accommodate the fast growing production schedule, Hired's plant in Oakland, Calif., moved into additional floor space giving a total of 100,000 sq. ft. A new branch plant is also being installed in Bakersfield, Calif.

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# AVIONICS

## Tacan Makes Public Bow, Passes Test

By Philip J. Klass

Netley, N. J.—The first public night showing of Tacan by International Telephone & Telegraph Co., whose Federal Telecommunications Laboratory developed the commercial navigation aid, demonstrated some of the advantages which prompted the military to develop the system.

Showing in an IT&T DC-3 over New Jersey, bearing and distance to the Netley Tacan ground station were presented to a small group of aviators, who, in addition, found it reported to be accurate to within one mile in bearing and within 2 miles of distance up to 50 miles from the Netley station. The private fleet of precision nearly at accuracy.

So far as the pilot is concerned, the operation of Tacan and its cockpit presentation of bearing and distance, which might have been coming from a VOR/DME, except that Tacan's bearing indication was unaffected by terrain which occasionally caused the plane's VOR needle to move several degrees.

### Similarities and Differences

The better DME/Tacan controversy has tended to obscure the true how similarities between the two systems and differences in VOR/DME. There are differences, however—differences which IT&T claims give Tacan its simplicity and growth potential. These include:

- **Closeboard DME**, in which individual channels are provided solely by frequency separation between stations as a result of the pulse coding/demultiplexing required in civil DME to provide sufficient channels. The Tacan closer tracks makes wavelength switching available for additional functions such as low altitude flying, landing, takeoff, park, and perch at some future date, voice communications via pulse code multiplexing.

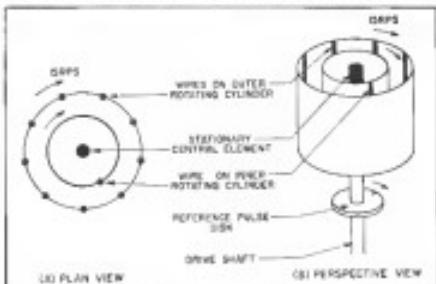
- **UHF-band (10,000 sec.) operation** of both bearing and distance. Previous radars' range limitation being far too much less efficient is known and obviated near the antenna than in VOR, which operates in the lower-frequency VHF band (112.5 MHz). For the same reason, Tacan can use a much smaller protection antenna than is important consideration for Navy, Army, and various USAF mobile installations.

- **Combined "course" and "distance" bearing indicating system** employed in Tacan makes it to provide greater accuracy than VOR.

Civil and Tacan DMEs operate on



TACAN, like present VOR/DME, provides pilot with bearing and distance to ground station.

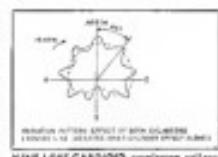


GROUNDS ANTENNA consists of center DME element and two rotating sections which produce

the same basic principle as airborne set: it sends an interrogation pulse which is received in the ground station causing it to transmit back a pulsed reply.

The airborne equipment measures the time interval between the interrogate and reply. The interval is proportional to the airplane's distance from the station.

Both types of DME transmit pairs of pulses for interrogation and reply to



NINE LOGIC GATES/1000: Interrogating patterns.



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Thunderhawk and Thunderchief rear fuselage sections awaiting completion on TEMCO assembly lines.

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AVQ-10 antenna mounted in nose of airplane scans the forward area, enabling the pilot to evaluate storm conditions for ahead.



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RCA's AVQ-10 is the first airborne radar to use C-Band (3.6 cm) transmission, the wave length most suitable for "looking into" storms, yet having the least amount of scope clutter. It presents the pilot with an easily-interpreted display of storm conditions ahead him. In addition, it gives the pilot valuable ground-mapping information.

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## HIG-4 GYRO

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- 2. Power Requirements: Running 1.3 Wats; Standby 2.2 Watts
- 3. Run Up Time: 1.5 Seconds Maximum
- 4. Angular Momentum: 10<sup>6</sup> Gram-Centimeters<sup>2</sup>/Second
- 5. Desired Travel: ± 2° Maximum
- 6. Gyro Constant Sensitivity: 10 mV/sec, with 2.5 m/s, 4000 rpm
- 7. Signal Generator Linearity Deviations: ± 1%
- 8. Torque Generator Linearity Deviations: Less than 1%
- 9. Input Rate: 4 Revolutions/Second Maximum
- 10. Drift Rate: 1° per hour maximum
- 11. Weight: 1.5 pounds

**NOTE:** The Gyro can be readily modified to meet your requirements. We invite inquiries regarding specifications.

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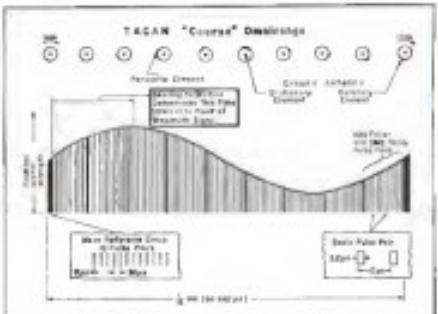
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"COARSE" despinning signal is produced by 15 cps rotation of ground antenna cylinder

distinguished from spin-off axis, or other DME pulses in the case of civil DME.

In civil DME, pulses 2.5 seconds apart are given out at 10 different possible times, 14 to 77 MHz apart, to provide 10 different range gates for each ground station receiver, making up for the finite omnibeam service. When a transponder reply is issued, the pulse occurs 12.5 ms apart, with each channel operating at a different frequency. Both the ground and airborne DME receivers contain two-pulse discriminators set to pass only pulses having the prescribed spacing and to reject all others.

During the initial "Search" mode of operation, when other types of DME is looking for ground stations replies, it transmits pulse pairs at the rate of approximately 100 per second. When a reply has been established with the ground station, this rate is lowered to approximately 10 pulses per second.

In order to prevent an airborne aircraft from mistaking ground replies intended for other aircraft for its answer to its own interrogations, the repetition rate of each airborne transponder is "wobbled" or varied slightly to give it an instantaneous repetition rate which differs from that of other aircraft in the area.

### Tacan II.S

An experimental Tacan system which provides the equivalent of 15S navigation approach service has been fully tested, according to TACAN officials. Use of 15S has been one of the criticisms leveled at Tacan by some opponents.

During the search mode, which may take up to 20 seconds, the Tacan receiver looks for ground station replies which are relatively synchronous with the local oscillator repetition rate. When a valid ground station reply is received, the reply is then checked to see if it is part of the Tacan omnibeam service. When a transponder reply is issued, the pulse occurs 12.5 ms apart, and the receiver goes into an interval operating ("final") mode.

If the Tacan DME signal is unanswered, but when the plane lands so that the fuselage screens the signal, the range gate maintains its distance calibration for a period of 10 seconds. If the DME signal returns within this interval, the airborne receiver returns to its track mode; otherwise the equipment automatically starts a new search cycle.

### Tacan Despinning

To understand the operation of the omnibeam (beamless) portion of Tacan, it is necessary to examine the ground station antenna. This consists of a conical-shaped DME antenna in front of vertical beamwidth radiators in which all linear RF energy is supplied.

Surrounding the center element is a fan with diameter 15 feet, made of an insulating mesh and is surrounded by a metal baffle. The result is a parabolic antenna, incorporating use of the RF energy emitted from the center element and reflecting it to the corner elements and enclosing it. The result is a broad pattern, which is the signal output of the pulses emitted by the central element as strength is lost in one direction (North, in the sketch, p. 56), and increased in the opposite direction.

The parabolic antenna is rotated during

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at 15 revolutions per second, causing the control pattern to rotate at this same speed. The effect on an aircraft's Tacon receiver is a 15 cps (angular) modulation of the signal strength of DME pulses received from the control station. Maximum signal strength will be received when the peak of the modulated pattern is in view, in position 1 of the switch.

If the center element is caused to move a quarter pulse rate at the instant the received peak sweeps past North, then the time interval between the reference angle and the instant of maximum received signal intensity according to the receiver's "course" hearing in the Tacon ground station. Shown on page two is a comparison of the detected phase of the 15 cps modulation appearing on the DME pulses relative to that of the North reference code established for appropriate aircraft hearing to the station. (See sketch, p. 61.) When receiver code consists of a group of 12 pulse pairs each 15 cps, 30 microsecond-long.

When VOR provides a 15 cps modulation of its transmission or carrier, the Tacon "course" hearing receives a 15 cps modulation of a group of DME pulses. If there is a sufficient number of DME pulses being emitted, the use of a pulse timing detector in the Tacon receiver enables it to extract the 15 cps modulation envelope and offer a 15 cps reference code to the aircraft receiver. Transmitter VOR antenna modulation periodically leaps down somewhere between 12% and 30% to the fact that the DME pulses are not modulated sufficiently to prevent their use for distance measurement. If, however, there are few aircraft in the area, DME reply pulses would be too infrequent to permit the Tacon receiver to extract a reliable envelope of the 15 cps modulation. To take care of this situation, the Tacon ground station implements 15 cps angular amplitude tracking, according to an IEEE-1 standard. Pulse train transmitted with both North and South Car Tacon ground stations operating at same frequency, indicate that the advance receiver antenna is modulated until the signal strength of the other becomes stronger. However, if positive Tacon station operating at the same frequency will be located 300 miles apart wherein feasible.

### Co-Channel Spacing

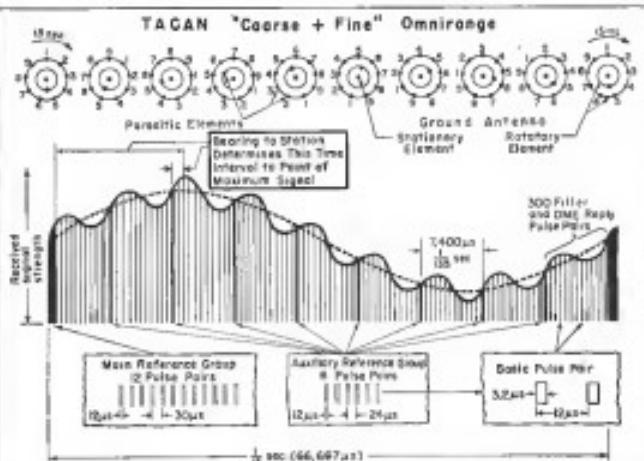
Table summarizes average R/T VOR, non-Tacon station can be operated at the same frequency within the single channel of the 15 cps modulated amplitude tracking, according to an IEEE-1 standard. Pulse train transmitted with both North and South Car Tacon ground stations operating at same frequency, plus an additional 300 miles distance and requires reference pulse pairs, to be described shortly.

This "constant duty cycle" type of operation plays another important role in maintaining an essentially constant load on the ground station power supply to prevent saturation which might introduce spurious signal level modulation or offset operating frequency.

As more aircraft penetrate the ground station and the DME "cyclic" stations increase in number, the Tacon ground station automatically reduces the number of "R/T" pairs.

### Precision Omnidirectional

Using this unique hearing technique in the addition of a "Coarse" or "Parasitic" system which is superimposed upon the "course" one already described. This is done in adding another ultrahigh cylinder 35 inches in diam-



PRECISION OMNIDIRECTIONAL bearing accuracy results from rotation of main and outer antenna cylinders which produce 15 cps modulation superimposed on the 15 cps "course" signal (above detail). Pulse relationship shown is for aircraft due east of the station.



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The Navy, Air Force, Marines, civilian airport authorities and even foreign governments, related weeks ago that SPAR—the ingenious, portable GCA landing system—could revolutionize heavy, cumbersome approach radar equipment costing five times as much. But could this startling new GCA make it when the going got really rough? The Air Force found out. Up at Ladd Field, Alaska, where the mercury started falling with 60 below,

they drenched SPAR with a fire hose, shaking it so hard it was barely recognizable. But the moment they emerged, SPAR, it poised to operate as safely as though it were in sunny Florida. No wonder the Navy has enlisted two SPARS to accompany the next antarctic expedition. Easy to carry, easy to set up, easy to operate, SPAR can be trusted to bring men in safely and quickly under the worst conditions imaginable.

could SPAR be the answer to your needs?



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TACAN ground station antenna atop Fokker Telecommunications Lab tower.

in, continuing wave-pulse (transient) reference code in the TACAN ground station antenna. The logic circuitry records the use with a single pulse train, and both result at 15 cps.

Each of the wave code in the mixer oscillator produces an instructional definition of the signal pattern induced by the center DME element. That produces a solid-state or magnetic switch which is energized on the center coaxial path. (See article, p. 56.) The overall result is to produce a 151 cps amplitude modulation ( $\% \times 151$ ) on the DME pulse induced from the center element, in addition to the 15 cps modulation.

The phase of this 151 cps envelope cannot be directly compared with the raw (North) reference signal used in the "come" return because there are two lobes, or cycles, between successive reference signals which would give one possible point, 45 degrees apart, each



HORNAT surface帖 antennas (left) utilize for TACAN, whereas VOR/DME requires use of both antennas.

AVIATION WEEK, September 16, 1962



**THESE RADAR COMPONENTS** fabricated by Lavelle help make advanced concepts in the use of electronics a working reality. Left-hand unit you picture above is such—a complete airborne radar search and control center for both offensive and defensive operations. Design for the "page-book" order in the control center referenced give altitudes of all aircraft within radar range.

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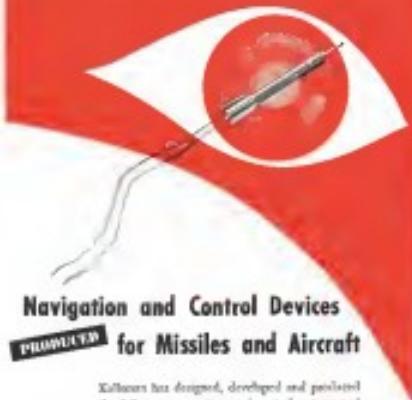
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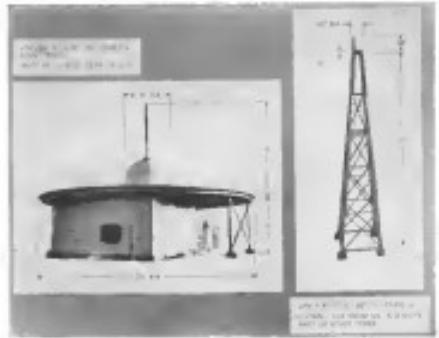


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with the same plane relationship.

### Resolving Ambiguity

To resolve this ambiguity, the T-101I utilizes means eight auxiliary reference codes, counter-coded for every 45 degrees of antenna rotation. The switch, p. 63, "T-101I Reference Signal Selector," completes the cycle. Each auxiliary reference group consists of six pulses, spaced 10 microseconds apart.

This enables the T-101 receiver to compare the phase of the 135 cps modulated signal relative to the main reference signal to establish which 40 degree arc the aircraft is in, so that to compare the phase of the 135 cps signal with the nearest auxiliary reference signal in

enable aircraft banking down to less than one degree.

The reference receiver has two entry pulse shifters, one gated up to turn at nine times the rate of the others, derived from a 10 MHz local oscillator. During the initial search mode, the direct signal shifts under the phase of the 135 cps signal, which controls the gating of transmit and receive units (Switch, p. 63). Reference pulse groups occur at the instant of the gate. When this happens, the T-101 transceiver gains in track mode. This receiver controls all of the wave radar in the output of the auxiliary reference group channel which operates to keep the 135 cps gate centered around the auxiliary reference pulse group. When the gate is so centered, the uplink's station having a propagation to the position of its own pulse train from the planefinder gear train.

If the T-101 transceiver signal is interrupted but during the track mode, the equipment will continue its last banking for three seconds. If the signal does not return within that period, the unit automatically returns to its search mode.

### Performance Details

The airborne T-101 receiver for transients has an arc of 125 channels, spaced 1 mil rad, in the L625 to L1250 arc band. The ground transients for singles are in use of 125 channels in the bands of 900 to 1,024, and 1,134 to 1,234 m.

For the first 65 channels, the airborne transients operate at a frequency which is 45 mc higher than the ground transients. For channels 64 to 125, the airborne transients have

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by the newest and most modern  
equipment and facilities required  
for advanced engineering. Your  
resume or visit will receive  
our immediate personal  
attention and response.  
Please contact:  
Felix Gaudet



TAGAN mobile receiver 8 x 10 x 17 in.,  
weight 26 lbs., uses 74 tubes.

space at 55 mc, lower than the ground  
transmitter. For example, when operating on Channel No. 1, the airborne  
auto-tuner channels at 1,025 mc, while the ground transmitter operates at 1,027 mc. When operating on Channel  
No. 64, the airborne interrogator trans-  
mits at 1,038 mc, while the ground  
transmitter operates at 1,131 mc.

Peak power of the transmitted pulses  
is 2.4 kw, and receiver sensitivity is  
quoted at 420 db below 100 watt. A  
Pulse discriminator is used in the  
receiver circuit to achieve low frequency  
selectivity. Selectivities less than 1/4 of  
the selected frequency are attained  
over 70 db.

The local oscillator operates on the  
transmitter frequency as the resulting  
intermodulation frequencies at 55 mc (super-  
position of transmit and receive frequen-  
cies). According to figures released by the  
Air Navigation Development Board,  
the worst spurious response is 73 db  
below the first response at 100 mc at  
42 mc above receive frequency in  
channels 1 to 42; and 42 mc below  
receive frequency in channels 64 to  
126. Response of the range frequency  
isolation is 30 db down.

## NEW AVIONIC PRODUCTS

### Components & Devices

- High horsepower 400 cubic centimeter  
motor size 15, rated for operation at  
1900 rpm. New Series 225T has  
maximum stall range of 1.45 to 1.65,  
no-load speed of 4,000 rpm, and reduced  
power rating of 12.2 watts. Power phase  
operates from 115, 230, or 460 volt  
as may be connected to 115, 230, or 460  
volt. Motor also is available for 60 cps current  
from John Deere Manufacturing Co.,  
1 Main St., Racine, Wisc.

- Modest torque and increasing only  
1.5% over a 1 mc, is available in any  
inductance up to 3 Henrys, with a very  
flat frequency range of 1,000 cps to



### Here is America's first commercial jet airliner

Above is the Boeing Jet Stratoliner 707 as it will look when it takes to the air. In prototype—America's first jet transport—it has been flying for more than a year. It has completed more than 300 hours of flight time—and reportedly Boeing will alone 40,000 feet and at speeds above 600 miles per hour.

Boeing has dedicated to the com-  
mercial airlines that could deliver  
jet transports so that flight operations  
could start early in 1959. Such early  
delivery is possible because Boeing has

the prototype flying now—in already

building a military jet tanker transport  
(essentially similar to the 707 Stratoliner)  
—and has accumulated vast experience  
in producing well over 1,000 B-47 and  
B-52 units for bombers.

The 707 Stratoliner—a sleek, fast  
jet carrying heavy—will cruise  
at 350 miles per hour range. It will  
make possible transcontinental flights  
in less than five hours, transoceanic in  
less than seven hours.

Incorporated in the Stratoliner are  
Boeing's special knowledge gained  
in 20 years of building such cogni-

presumed aircraft, and the full 39  
years of the company's experience in  
the aircraft business.

It was this leadership that gave  
commercial aviation the nonstop 240,  
the 314 flying boat, the original  
pressurized transport Stratoliner 307,  
and the Stratocruiser, and gave the  
military the B-17 Flying Fortress,

the B-29, the super B-47 and the  
night jet B-52.

**BOEING**



*Rolls-Royce built the first  
propeller turbine aero engine to fly.*



*A Rolls-Royce propeller turbine  
engine was the first to be officially approved  
for civil aviation.*



*The only propeller turbine  
engined airliners in service in the world  
are powered by Rolls-Royce.*



*Eighteen airlines have ordered  
Rolls-Royce propeller turbine aero engines.*



*Capital Airlines have bought  
Rolls-Royce propeller turbine aero engines.*



# ROLLS-ROYCE

AERO ENGINES LEAD THE WORLD



150 lb., depending upon reduction value. Unit withstands temperature of -40°C. and 25°C. Con hot wire leads specially designed for printed circuit use. Thermal time constant 0.00001 sec per millivolt. Hyatt Co., Inc., 31421 Van Allen St., North Hollywood, Calif.

- Magnetic pulse generator, Type MP-41-A, to trigger solid-state diodes can replace four vacuum tubes. Design is a low-type pulse whose repetition rate is equal to low frequency. Input voltage is 12 or 24 V at 400 cps. Pulse output is 100 V at 100 cps with a peak width of 100 µsec at 50% amplitude. Unit weighs 14 oz. Bulletin EB-704 gives application data. Magnetic Research Corp., 280-202 Costa St., El Segundo, Calif.

- Speech actuator, Type 100-MS, operates at 1200 cps/sec, but has built-in control system action to eliminate electric and housing contacts. Contacts are handle 1.5 amp resistance or 5 amps resistive load. Coil resistance up to 10,000 ohms can be available and drop out can be adjusted to 65% of pick-up voltage value. Built-in coils are hermetically sealed capture with solid platinum base or with zinc case, and is available in a variety of contact arrangements from SPST to DPDT. Unit measures 11 in. dia x 12 in. high. Ebaud Tech-Electronics Corp., 57 Davis Ave., Lexington, N. J.

- Solderless connection for printed circuit boards called "Mesa Pin Series," uses shielded dielectric, insulation, and other component leads can be connected without soldering. The socket's sprung face holds component leads tightly, yet

allows easy removal. The height of the pins is 0.025 in. and the lead pitch is 0.0625 in. Two series of pins are available, one for 100 mils and another for 150 mils. Technical literature is available from the manufacturer.

Another job in the beginning of the program was to photograph the large pile of press materials accumulated over the years and gather away a copy of every article.

After the first year of intensive work to bring the program up to date—with the vast majority of the remaining department representing the former single effort—then the 10-man program was started as a full-fledged CTD task force for safety inspection.

Today they are based in a special room with temperature and humidity control in the center research city of Palm Springs, 170 miles distant, where an ordinary metal cabinet holds the accumulation that runs close to half a warehouse.

After the day-long sleep of the past two months, the 10-man team of thermal experts was disbanded, and Whistler embarked on a continuing program of maintaining coverage



(Advertisement)

# Valve Talk

for WM. R. WHISTLER CO., Ltd.  
By Marvin Miles,  
Sales Manager, Avionics Williams Aves.



Like many another up-to-the-minute company, Whistler started itself and its customers with aeronautics.

The operation started some years back when a neighboring factory was razed by fire in the early morning darkness. The plant was totally destroyed, including every record, every piece of correspondence.

The charred, water-soaked chaos, the mangled machinery represented not the big loss, but buildings, equipment and furnishings were recovered by word, and for the nearby company was left in ruins losing without one cent of paper covering its deepest interests, attorney, winter personnel and other financial assets.

The company's proximity to Whistler, the location for research production, and consideration of stage production made it feasible to start the design and manufacture of valves to help the designer. A battery of scientific cameras and studios was purchased and the necessary programs modified to conform to the task of photographing every valuable instrument in both the company's acceptance.

If five or ten hours should work any one of the older cameras' plants today, and require dressing up before taking the next picture, Whistler has the answer. Within two or three weeks—should be reproduced through the magic of television almost at a snap.

Bigger job in the beginning of the program was to photograph the large pile of press materials accumulated over the years and gather away a copy of every article.

It took a number of months of intensive work to bring the program up to date—with the vast majority of the remaining department representing the former single effort—then the 10-man program was started as a full-fledged CTD task force for safety inspection.

Whistler has found that maintaining coverage, conducted on a systematic basis, takes little time and requires negligible expense over the company's operation. Necessary equipment (cameras for motion pictures, motion picture cameras for television) are purchased.

While protection for both the company and Whistler customers was the main objective, running savings in space were realized as an unexpected additional benefit of the film recording process.

## EQUIPMENT

### The "Hercules" of hoses flies with the Lockheed Hercules



Powerful is the word for Lockheed's C-130 Hercules...with its long range and capacity for tough assignments.

"Herculean" strength and endurance also characterize the Resistoflex-T hose assemblies that convey fuel and oil on this plane and on its four turboprop engines.

Fluorocel-T R3600 hose assemblies represent the latest word in aircraft hose progress. They're 300°F lines. These are the only assemblies using a tube compounded from Teflon that have A-R approval for synthetic fuels, oils and nitric acid.

Get the facts—send for Bulletin PH-2

Resistoflex is a registered trademark for products from Fluorocel-T, Vinylite, Vinylene, Duron, Resinol, Grade 6000 for tire and aircraft-glass plate.

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 Resistoflex also manufactures other specialized products for the aerospace industry made from Teflon, Kel-F and Fluorocel—such as resin, sheet, fabric, parts, electrical wiring, spiral bushings, etc.

### Airwork, Pratt & Whitney Push Hi-Per DC-3 As Executive Plane

By George L. Christian

Milwaukee, N. J.—The Airwork Corporation and Pratt & Whitney Aircraft, encouraged by the performance of the Hi-Per DC-3, are pushing the R2000 powered transport in a fast, new commercial executive plane.

The aircraft will cruise at well over 200 mph and have greatly improved range, engine and high altitude take off performance over standard DC-3s.

At Airwork's Bridge Division and Milwaukee, a P&W R2000 aircraft with FEWA, a Hi-Per DC-3 pilot produced the plane's school performance figures to back up the company's claim of how much better an aircraft Hi-Per is compared with the conventional old work horse. The figure carried authority because he also flies an R2000 DC-3 and DC-2, giving him an incentive and stick for performance comparisons.

While R. E. Sherff, chief pilot of Thompson Products, Inc., listed the R2000's performance figures the plane staff had parked on the tarmac at Airwork's airport for all to inspect closely.

Apart from the R2000/TM2 power plant, light weight Hirschman Standard propellers and other improvements, is limited to the Hi-Per DC-3 configuration, the Thompson plane also includes a composite wheel well shell and sheet metal skins. Stand control is that the doors add about 5 mph to the plane's speed, while the short skins knock 60 ft per engine off its weight. Thus, she also needs to reduce weight near over the engine, no longer needed in the fuselage except by dual-wheel mounts. Previously, 1 carabiner bolts can mil pipe and would tremendous torque vibration to the plane's structure.

**Weight and P&W**

Another highlight of the conference was the announcement by Canadian Pratt & Whitney that they were going to manufacture the Wright Astro engine, the R1323, under license. Canadian firms bought the Canadian R-1323 which mounts the engine in the plane is being built in Canada by de Havilland.

The Canadian government wanted to build its own engine to avoid having to depend on a foreign design. Costs 26% in the tank, manufacturing of parts requires in Canada. Result the firm is building Wright powerplants.

An announcement at that time was a plan developed by representatives of

The Thompson pilot stressed the fast fact that after 400 hrs of operation, the engine has fractional performance without a single spark. Other Hi-Per features exceed 36. Sherff:

• Modifications have boosted cruise speeds from 175-180 mph to 200-215 mph.

• Extra power in case of engine failure during take off at maximum gross weight. With the R2000, the situation can be critical. With the R2000s, the plane will clear out with a prop "winding-up"—so even at 45°, it's quite safe.

• Fuel consumption ranges from about 100 gal to approximately 115 mpg, but the maximum speed gains the Hi-Per a slightly greater range. (Fact) consumption figures are a range and include start-up, taxi, off, climb, cruise and let down.

Sherff says fuel consumption problem which existed when the engine was first installed have been licked.

• Prop vibration has been eliminated by balancing the shaft dynamically.

Commenting on the "thin shell" does, Sherff said that, in effect, they allow the plane to cruise at the same speed with 500 lbs from each engine to 1,100 lbs per engine before the skinning would be violated.

The net effect is to increase range and reduce noise and heat on the power plants.

An added bonus is the fact that the plane goes straight track. After only eight seconds as compared with 21 seconds—maximum safety by cutting speeds in case of a ground.

#### Conversion Cost

Sherff told Airwork's West that his company was so satisfied with the Hi-Per's performance that it had authorized the modification of 320 and DC-3 in the R2000 configuration as soon as it comes up for engine change.

The regimen we bought from Air work, while the actual modification is performed by Pan American World Airways in Miami. Total cost of the conversion is between \$90,000 and \$100,000.

An announcement at that time was a plan developed by representatives of



R-1323 ENGINE on Thompson Products Hi-Per DC-3. (R) shows short exhaust studs. (L) "thin shell" door.

the division of Bendix Aviation Corporation concerning their various powerplants. Divisions represented were Brads, 201, 202, Brads, Brads, Seattle, Seattle Products, Eclipse, Everett and Utica Divisions.

#### New Facilities

J. S. College, Airwork's own plant facilities, reflected some of the new facilities the firm has established since the writing last year. This include a new warehouse to speed parts delivery, one in Newark, N. J., and others in Atlanta, Ga.

To improve the quality and scope of its work, the company has added 51,000 worth of new machinery, including a new press, new cylinder bore honing machine, universal milling machine and several sets of tools.

The return of the division can be judged by the success it attained in 1955 over 1954. The profits increased from 113 to 177 and the number of employees increased just past 500 to 102.

### Southwest Fills Quota

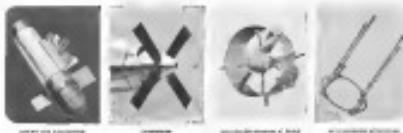
Southwest Airlines Co. delivered its first July cargo of weathered 513 jet engines to the Air Force. It was the first shipment of a contract involving more than 1,200 powerplants and worth about \$1 million. The Delta overhead agency held additional to its holdings, entered an engine test cell, trained personnel and had its production lines rolling in 133 days to make the initial delivery.



Aeroproduts synchronized actuators ensure positive synchronization of multiple hydraulic actuators.

## Precision Positioning!

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What's more, these actuators, in both hydraulic and pneumatic versions, are applicable to all high-and-low-temperature installations, including jet engine thrust reversers, flaps, and split-surface surfaces on guided missiles.

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The first four isolators shown above, consisting of two temperature discs, are approximately 110 mm. in diameter and 10 mm. thick. They are designed for use in aircraft applications. Isolators are also available for use in space applications. For more information contact G. M. Conner, 918 E. Green St., Pasadena 1, Calif.

The new 20 pieces Aero Supply Mfg. Co. Inc. has been a leading designer and manufacturer of heat rejection components made materials and metalized air filters for all flight applications. Quick lead representatives and engineers are available to assist you in your inquiries on specific engineering and application problems.

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## NEW AVIATION PRODUCTS



### Aircraft Fuel Booster Pump

Electric motor driven centrifugal pump Model RG 11280 I weighing 6.5 lb. is rated at 6,200 gpm at 27 ft per minute discharge pressure using jet engine fuel and has continuous duty life of 200 hours minimum. The unit has excellent high altitude performance and can be operated at current ambient temperatures of -45° to 160° F. and Red Temperature range -65° to 110° F. Motor is 845 rpm, 27.5 in. 26 amp. It is centered through the base and a seal disc prevents fuel leakage into the unit.



### Filter Purifier Hydraulic Oil

To provide clean oil for hydraulic systems and transmissions, Translant Filter Purifier clean oil content units to within 1% accurate from raw and used material, the motor reports.

The variable unit can also be used for the removal of water from tanks of hydraulic oil during drain cleaning.

The purifier has two filtering stages and vacuum and air filtering at both which includes one magnetic and magnetic and seven ceramic dust type filters.

Fairchild Manufacturing Division,  
Wright-Rolls Co., Inc., Buffalo 13,  
N.Y.

### Emergency Power Battery

Ultralightweight 24v. rechargeable battery for emergency duty in high speed aircraft provides power for test and strip indicators and cockpit lighting.

The battery reportedly operates without electrolyte leakage during accelerations of attitude as high as 60 g's.

The 21 cells are mounted together in a block and bound with glass fiber tape, interdigitated with positive terminals for unusual strength. Weight is less than 3 lb. with dimensions of 12.1 x 4.25 x 3.75 in. Individual cells weigh 7 oz.

Nife Batteries, Redditch, Worcester, England.



### Pressure Transmitter Handbook 25G

Model 421548, high vibration pressure transmitter operates at 0.05° to 0.22° C. (±0.05° C. absolute) or 0.05° C. (±0.05° C. absolute). Stable subject to environmental vibration of 20G at frequencies up to 2,000 cps.

Receptacle is located in the rear section of the potentiometer winding of 200 turns (0.497"). Weight less than 6 oz. and has a length of 2.4 in. and a diameter of 1.13 in.

G. M. Conner, 918 E. Green St., Pasadena 1, Calif.

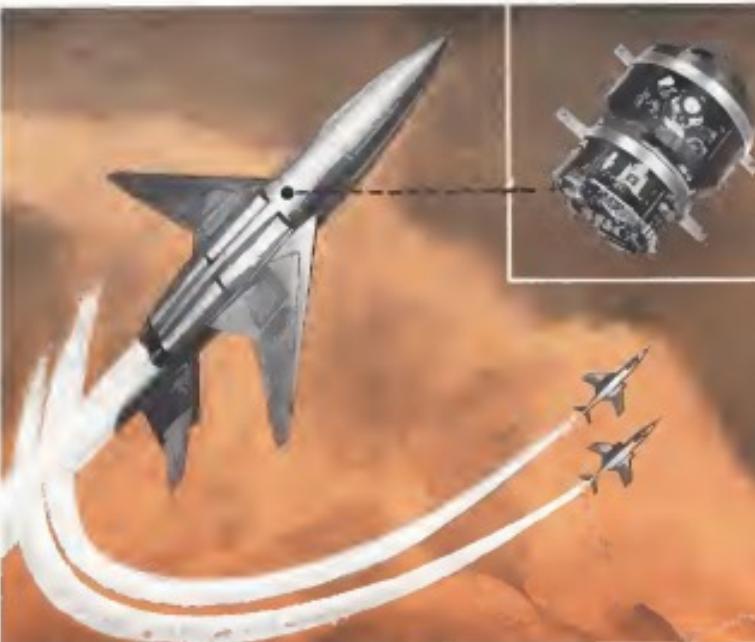
### Globat Weighs 5.5 Oz.

Model C110 miniature electronic scale which has a power consumption of 5 mW. The unit with a response speed of about 12 to 15 millivolts can be used as a high-speed mass measuring device and for dry applications for relatively periods of time, as well as for oil-in-pellet mixer.

Globat has a built-in self-aligning system between driving and driver output coil positioned at the center of the instrument. The clutch weight 1.4 oz. is a torque output of 7° to 10°. Dual Products Co., 7 Bergen Court, Bayonne, N.J.

## Bendix 3-GYRO STABLE PLATFORM<sup>®</sup>

\*Developed in cooperation with Right Control Division, Wright Air Development Center



**NO GIMBAL LOCK.** Functions through loops, rolls, turns in 100° elevation about any vertical axis without encountering gimbal lock... ...at rates that meet performance requirements of highly maneuverable aircraft.

**UNPARALLELED ACCURACY/WEIGHT RATIO.** Weight 25 lbs., . . . occupies only 1/2 cubic foot of space. Attitude drift rate<sup>1/2</sup> in 1° per hour max., varred drift rate<sup>1/2</sup> in 2° per hour max., threshold of vertical tiltmax<sup>1/2</sup> in 3° off vertical, . . . based on more than 2000 hours of performance testing.

**VERSATILE IN APPLICATION.** As attitude reference, the Bendix 3-Gyro Stable Platform can replace all vertical and directional gyros used for such functions as autopilots, auto pilot control, fire control, radar stabilization, gun turrets, etc. It can be used as either free or shrouded platform, but normally is shrouded to vented.

\* Total power requirement is only 35 watts. Operable to performance specs within 3 minutes after power is applied.

• Designed for simple, speedy maintenance • Equally applicable to fighters, transports and missiles.

For complete information on the Bendix Stable Platform, write to LIFE-PIVOTEE DIVISION, WENXIS AVIATION CORPORATION, TETERBORO, NEW JERSEY.

State Office: 107 E. Fortification Street, Newark, Calif.  
Sales Office: 1000 Madison Avenue, New Haven, Connecticut, 265 Broad Street, N.Y.

**Alternative Displays.** Displays are now available for use with all ADF and ADI displays. The antenna, receiver and signal processing circuitry are identical to the Bendix 3-Gyro Stable Platform.





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## ALSO ON THE MARKET

Neo-Flasher strobing lights are used as industrial warning lights. Model 1-100 LSR is mounted atop portable pedestal adjust in lighting gear of Douglas A-10 Skyraider twin jet bomber. The lights require no batteries, no fuel and no electricity saving and not weatherproof. Light is operated by vacuum and produces up to 1,000 hours. Neo-Flasher Manufacturing Co., 3718 Valley Drive, Berwyn, Calif.

Rock sawing for Type S 110 rock-sawing diegrapht was designed to permit use of the diegraph as groundable installation as well as a fixed attachment in permanent installations. The entire diegraph fits forward from the neck as a special blade, permitting removal of the second magazine without taking the diegraph from the neck. The new model is constructed of 0.05 in. steel stock and measures 12 in. deep by 18 in. wide for insertion in a standard vertical rock. Its features include: 38 at 50 cfm/min., lower frequency response from 0 to 4,000 cps, several speeds from 5 to 190 rpm, two timing links, high efficiency, accuracy, "true". Consolidated Engineering Corp., 300 N. Sierra Madre Villa, Pasadena, Calif.

"Walker" electric handi-drill for handwelding jobs weighing up to 10,000 lb. It also is available in capacities to 30,000 lb. Maximum reel diameter which can be handled is 90 in. wire gauge is .06 in. Maximum reel weight is 65 lb. Track operates with the handle in any position—including vertical—and where ends of varying lengths must be handled—Lew-Sized Products Inc., Dept. K-25, Milwaukee, Wis.

Type II vibrators, weighing 8 lbs., are supplied in a portable unit for non-destructive testing in field use or as a panel-mounted unit for use on either new or existing test equipment. Includes rheostat, filter, filter cartridge and AN outlet fittings. They vibrate designs explained so the instrument makes possible and achieves within 10% of indicated measurements. At point of the scale ranges are 5 to 10 and 30 to 300 vibrations per minute for measurement of oil liquids used in testing aircraft fuel and hydraulic system components. Gossman & Research Laboratories, Inc., 16 Birchwood Ave., Detroit 5, Mich.

An clutch pump includes an electro-pneumatic control, pressure switch, friction finger tip starting and stopping. The pump may be single-tripped with

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1/4" and 1/2" NPT 5000  
Operating pressure: 5000 psi.  
Working pressure: 1000 to 7000 psi max.  
Weight: 4.0 lbs.  
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2000 psi capacity at 100° F.

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**"2000" PILOT OPERATOR,**  
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Operating pressure:  
3000 psi.  
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SERIALIZED OUT Continuous  
DRAFT TESTS, U.S. Navy  
1/2" NPT.  
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**"2000" PILOT OPERATED WITH**  
NORMALLY OPENED,  
1/4" and 1/2" LINE SIZES  
Operating pressure:  
3000 psi.  
Weight: 4.0 lbs.  
Size: maximum 1.5" x 2.5" x 3.5".

**"2000" Pilot Operated Valve with**  
2000 psi Capacity.  
1/2" NPT 5000 psi.

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hand or foot control or automated controls. Patent #3,110,001 and future higher speed operation with increased safety—U.S. Patent Office, Elkhart, Ind.

Nylon split-cup solenoid features low cost, speed and simplicity of installation with electrical and mechanical protection in split joint "Sparc" design allows faster, perfect insulation of race sleeve. New mode for continuous threading, stripping or twisting of wirebraid during installation and possibility of bypassing even under extreme vibration. Threader makes both of solenoid parts easy regardless of orientation—Sparc—Electro-Mechanical Electronic Products Corp., Hyattville, N.J.

Platinum electrode spark plug is GIA approved by all. Part # 81000-81000-NATO R2300, R2300-R, R2300-C series. Model R2300 features a 1.18" oil writer tip, a new center fire design for starting and a new platinum ground electrode design for long life. R. G. Corporation, 321 Broad Ave., Ridgefield, Conn.

Completely automatic automotive tube cut/push button operation with three heat control cycling control, an external tube control, tube control and opening and closing. The control maintains constant push-cut temperature.



during all of its cycles and records a lifetime record of each sample cycle. Applications are used in the medical industry, aircraft product manufacturing, robotics, plastics and glass, cables—Philip J. Davies, Inc., Kinston, Ohio.

High-accuracy profile milling machine is used for three-dimensional automatic edge milling of thin flying discs, plastic dies, rubber and glass molds and turbine blades. The 10-inches provide a constant rate of feed relative to the form being copied and will allow curves with varied slopes to be copied automatically—Wichman Precision Corp., 10521 Capital Ave., Oak Park, Illinois 60302.

Low torque optical plate, designed for aircraft applications, is all stainless

bored or foot mounted or automated controls. Patent #3,110,001 and future higher speed operation with increased safety—U.S. Patent Office, Elkhart, Ind.

Nylon split-cup solenoid features low cost, speed and simplicity of installation with electrical and mechanical protection in split joint "Sparc" design allows faster, perfect insulation of race sleeve. New mode for continuous threading, stripping or twisting of wirebraid during installation and possibility of bypassing even under extreme vibration. Threader makes both of solenoid parts easy regardless of orientation—Sparc—Electro-Mechanical Electronic Products Corp., Hyattville, N.J.

Platinum electrode spark plug is GIA approved by all. Part # 81000-81000-NATO R2300, R2300-R, R2300-C series. Model R2300 features a 1.18" oil writer tip, a new center fire design for starting and a new platinum ground electrode design for long life. R. G. Corporation, 321 Broad Ave., Ridgefield, Conn.

Completely automatic automotive tube cut/push button operation with three heat control cycling control, an external tube control, tube control and opening and closing. The control maintains constant push-cut temperature.

With each "boom" of a jet cutting through the sonic barrier, aircraft engineers give the sleeping dragon just another burst. But there is space—which mankind has dedicated itself to once—less the ugly, malevolent form of the next big challenge—temperature!

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corrosion proof switch that can be used from sand, aluminum or titanium. Simplified design characterizes this seal for storage or after-heat fraction parts. Several standard assemblies can be selected and swapped together to make an efficient integral unit arrangement to suit installation and operating conditions. —The Westinghouse Co. Aviation Div., Allentown, Penn.

Model BT-2 has an open back, a clockwise power brush type punch press for a more productive output of 250 operations per minute in continuous operation. Punches and dies can be made cheaply from cold rolled stock for short runs. Weighing 315 lb, the press is rated to send stampings. Standard stroke is 2 in., 1 to 14 in strokes are also available. —Alva Alum Industries, Clinton, Mass.

New precision break center holds machined part within 0.005 in. parallel to angle. Commercial tolerance gauge holds along part, successive measurements are also available from one angle.



Break center weighing 16 lb., holds work up to 51 in. long and 15 in. in diameter.—Transonic Corp., Worcester, Massachusetts, Pa.

Sparflite kilo, for use in fixed-wing 14 ft. span aircraft, comes ready to go to gather and can be used for each new operation. Adjustable shims enable adjustment of growth by prior film can be folded from the back without disturbing production.—Speedflexible Equipment Co., Ft. Cox, St. Paul, Minn. 5, N.Y.

Wichita's 1120, stand-energy welder, is the first to have three times the energy storage of its predecessor, the 1100. Welds are held firm and high strength welds without discontinuity or metal fatigue change are formed. The machine can dissipate heat with cooling diskless. —Crown Corp., 273 N. Hubbard Ave., Pasadena, Calif.



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BAE—Boeing B-47 Stratojet, powered by General Electric J47's, has now accumulated thousands of engine hours a day.

## G-E J47's pass 7 million hours, are now adding 11,000 HOURS A DAY

Operational data paying off in newer G-E powerplants of advanced design, greater performance

General Electric J47's installed in military fighters and bombers recently logged their seven millionth hour. And they're now increasing this figure at the rate of 11,000 hours every day. By the end of this year, J47's will be accumulating 12,500 hours a day! How is the J47 experience benefiting U.S. jet aircraft? First, G-E's accumulated know-how has, since 1948, resulted in a 25% more powerful non-regulated production engine. SFC has been lowered. Component improvements have length-

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The large, modern building pictured above with 225,000 square feet adjoining Republic's Farmingdale plant has just been added. A corps of pioneer leaders is working with much interest by material contributions of top blood, unshamed by historical tradition. New ideas being developed will be in research-leading as Republic's many past achievements in aircraft design.

The fundamental scope of these operations has created a large number of positions for men with a broad general development background. We invite today's leaders in these areas, by checking into the opportunities open with our staff of development engineers and scientists. Republic's hands-on program for its professional staff is unparalleled; the pay scale is a model for the industry. Relocation expenses are paid.

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ENGINEERING AHEAD FOR A BETTER TOMORROW

# NORTH AMERICAN AVIATION, INC.







# AIR TRANSPORT

## Vigorous Air Coach Growth Continues

Prospect is that 65% of domestic trunkline business will be sold in the low rate category within a few years.

By Katherine Johnson

Washington, D. C.—Bargain air coach business now accounts for more than \$390 million of the scheduled domestic airline total \$1 billion worth business.

The total volume of the total, last year \$1.5 billion for the year ended June 30, was up 1 million since year for the previous year. The number of non-stop coach passengers increased by 123,000, 800 more passengers. 57% of National's total domestic business in revenue passenger miles was in coach service for the last year. More than 50% of Eastern's revenue passengers flew coach.

Between Eastern and National Airlines for the New York-Miami traffic, the number of coach passengers carried by Eastern for the year ended June 30 was over 1 million more than for the previous year. The number of National coach passengers increased by 123,000, 800 more passengers. 57% of National's total domestic business in revenue passenger miles was in coach service for the last year. More than 50% of Eastern's revenue passengers flew coach.

### West Coast

United Air Lines—despite the strenuous opposition of its President, W. A. Patterson, to coach travel—has gone all-out with coach services, operating 45 non-stop flights daily over the Los Angeles-San Francisco route, and even going beyond DC-6B aircraft in all flights. This is United's answer to the aggressive policies of Western Air Lines and the additional competition of non-scheduled and intra-state carriers on the route.

### Transcontinental

TWA is emphasizing low cost coach service. The major carrier right in between TWA's coach flights and the trans-service of the DC-7s of United

and American Airlines. So far, the DC-7's appear to be holding a substantial part of the transcontinental business. Flight coach traffic totals in the \$150 million range transcontinental wise. Now, though, is the low cost flight of \$80, initiated by TWA, to lure them to coach service.

### Two Carrier Decline

Civil Aeronautics Board approval of TWA's plan for "repositioning" service—coach and first class passengers on the same flight—means another one, and major, factor in the competition for transcontinental traffic. American appears opposed the TWA plan in its position to CAB. United also who has opened but did not use a section. But because of both before are about consolidating, consolidating their operations and integrating under "common carrier" status.

"It isn't fair to be a question of what we want and what we believe is right," as American official commented. "It may be a mystery of what we have to do to assist competition."

American's concern will the trans-

continental tourist pay about \$80 more

for somewhat more spacious accommodations—a meal or a cup of coffee on the same airplane?"

The coach business of only two

domestic trunklines shows a picture.

Although Capital won a place in



AIR FRANCE

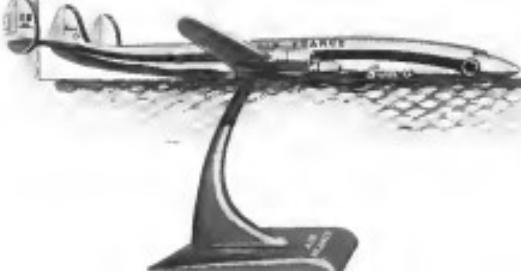
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## An Open Letter to American Flag Carriers

Year in and year out, you are the best customers for the world wide Air France network. This free flow of traffic between Air France and American Flag Carriers is indeed gratifying. We wish to express our warm thanks for your business and for your confidence in the dependability of Air France Services. We assure you that in the future, as in the past, the high standards of Air France will be maintained. We pledge continuing cooperation in realizing our common ideal of "one world" of travel.

*Henri J. Lescure*

Henri J. Lescure  
General Manager  
North, Central Americas  
and Caribbean Division



## Coach Traffic for Domestic Trunklines

	Revenue Passengers		Revenue Passenger Miles (200 Millions)		Load Factor Percentage	
	Year Ended June 30, 1954	Year Ended June 30, 1955	Percentage of Total Scheduled Business	Year Ended June 30, 1954	Year Ended June 30, 1955	Percentage of Total Scheduled Business
Dom. World	891,985	1,214,912	23.61	1,090,213	1,426,312	78.60
United	714,300	1,070,305	19.71	868,918	982,369	73.73
Eastern	636,609	1,718,495	47.58	579,469	1,375,773	49.85
American	521,619	1,382,176	12.53	760,637	916,877	83.16
National	500,990	695,477	43.99	312,511	476,474	56.15
Southwest	311,396	339,414	49.76	294,674	380,487	71.68
Capital	302,756	378,700	11.14	148,434	131,094	4.09
Stearns	263,690	393,668	13.38	124,499	143,805	35.57
Delta	189,753	215,483	13.84	137,681	134,096	54.25
Colonial	75,367	95,308	8.15	50,061	74,760	87.47
Road		45,462	2.92		25,781	4.40
Continental		"			55,681	9.34

\* Not available

coach business, its scheduled routes is not well suited to coach-type service. A string of 510 flights a day, not a great demand. Capital has driven straight daylight flights. This resulted in a decline for the year ended June 30 of 25,300 revenue coach passengers (11,364,000 revenue coach passengers total). The carrier plans to return to coach coach patterns. In addition, company executives are considering the possibility of new coach flights over sea routes already from Cali between New York/Philadelphia, Detroit, Chicago.

Calmair's decline in coach business is likely due to less moderate equipment (DC-9) compared to 60's aircraft. Pan Am, too, had a bad year. Continental's air route traffic dropped by 10,851 revenue passengers and by 27,000 income passengers below the previous year.

#### Proportion Continues

The isolated service—whether, or relatively so, in the posture of competition—will continue to plan to maximize passenger low-fare air coach. But there is great concern that coach is simply a last-ditch approach to a lower air fare level. Many airline officials complain that the difference between first class and coach is now negligible, particularly in view of the fuel surcharge.

The popularity of "best" type service without accompaniment to using coach before the difference between first class and coach service has been discerned for several years, but it still appears to have little favorable industry response with the possible exception of American. Company officials say that the overhead cost of making reservations is minor, and does not balance the disadvantage of the "no reservation" policy, particularly because initiation of having to make travel tickets for one flight from Capital started its coach service. The carriers' own 510 flights a day basis. Competition often occurs, offering the same fare coach service on a nonstop basis through United, Capital or Pan Am.

#### Revenue Gains

Here is the dollar volume situation of the various bus coach services for the year ended June 30, 1975 (and the previous year):

- TWA: \$60.1 million, compared with \$58 million; a \$1.1 million increase.
- United: \$41.5 million, compared with \$29.4 million; a \$12.6 million increase.
- Eastern: \$37.1 million, compared with \$23.9 million, an increase of \$13.2 million.
- American: \$18.5 million, compared with \$12.4 million; an increase of \$6.1 million.
- National: \$19.2 million, compared with \$15 million, an increase of \$4.2 million.

## Independents Hit Air France Subsidies

Paris-SG spokesman for three privately-owned French airlines recently charged that government aid to the state-owned Air France in the last ten years has permitted the carrier to increase its capacity by 40%, while the independents suffered a 25% loss.

The complaint came in relation to an offer later addressed to all members of the French National Assembly by Air France to the government, with Air France asking the government of freezing price increases in French Union airports. Last year Air France's profits in its French Union entry are said to have offset half the losses in continuing international operations. During the year Air France had more than \$6 million before taking account of direct government aid.

He pointed out that Air France has received \$140 million in subsidies since 1947 in the form of subsidies or government-assisted loans.

## Italy Will Expand Airline Operations

Rome—The Italian government plans to spend approximately \$2.6 billion expanding domestic and international airline services during the next three years. The costs will be divided evenly between IRI and ANSA.

IRI's domestic services in the "depressed" areas in Southern Italy are to expand on local basis to encourage increased traffic. RISI will expand regional air routes to connect the country's major cities to remote areas of Italy will result in reduction of this backlog.

ANSA will be encouraged to do take advantage of money in the form of aid from Australia and from Rome, Nairobi and South Africa.

## American Protests

American Airlines has protested to the Civil Aeronautics Board that a consolidation of travel clubs would result in losses for many of their users. "In the dynamics of the travel club market, the public has no voice for their safety,"

One example of Eastern's sales liaison contract flights for 11,000 miles before just a flight in an airplane. In this program Eastern also had an air on the long range intrastate bunch of connecting intrastate routes the clubs.

United will put up \$500,000, which will go to a few weeks with more credit on an air mile. The movement of clubs that stuck will account for 15% of its 1976 budget, compared with 29% in 1974. United plans a major effort in air miles in 1976 and 1977. While 26 new fare-enriched awards are delivered in these years, the company contemplates conversion of 46 DC-10s to clubs.



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mission of the new trainer by permitting smoother, safer transition to jets at an earlier stage of pilot training. This, in turn, reduces training time and costs.

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WICHITA, KANSAS



## Trunks Battle for New Routes In Final Round of Denver Case

Washington—Civil Aeronautics Board concluded the 18-month Denver Service Case with oral arguments last week that produced an explosive final round.

American Airlines attacked both Trans World Airlines and United Air Lines.

United then tackled TWA and TWA struck back at both American and United. All three of the major postal carriers were accused of being "stuck" of competition by the proposed mail rules.

The interests of the airlines fighting in the Denver Service Case highlight the concern sensible by the industry for new routes, a development that has occurred with the recent change in rules at CAB.

The Board is at present making new route awards after a long reliance on technological as a substitute for route expansion.

All of the carriers have not yet submitted evidence to the Board's changes in route. Commenting on the lack of new route applications and the Board's stated desire to rule this through, United's president, W. A. Patterson, claimed: "There is absolutely no uncertainty on the part of airlines as to how far CAB intends to go in creating new routes and paralleling routes. As a result we are filing for new routes in order to maintain a balance of some portion."

### Removal of the restriction on trans-

continental service to San Francisco-Oakland.

- Certification for service at Denver.
- Permission to be operating between Denver and Los Angeles.

Trans World, in turn, strongly asserted for further streamlining American's route, claiming that unrestricted rights at San Francisco would make that carrier irrelevant of value since just about every new route under TWA's control since 1947, except for the Board's grant of rights to Pan American to great fanfare, originated in TWA's system. For Denver service—the system for the entire case and most all other applications.

"Actually, American and United are probably using the proceeding as a 'guinea pig' for new route awards and extensions completely unrelated to the needs of Denver," he declared.

The Board was asked to recognize the existing differences in Denver as severe, which Congress attributed to "United's current monopoly."

He charged TWA is best suited to serve Denver's urgent need of long-haul service, particularly in the air coach field.

## CAB Proposes Feeder Mail Rate

Civil Aeronautics Board proposed a mid-continent carrier mail rate structure for the 13 local service air carriers last week which will result in an annual saving to the Post Office Department of \$237,000.

An equal amount of money, however, will be paid out in subsidy by CAB to the same carriers (AW Sept. 10, p. 115).

The changes in the local industry's mail price scales are based on their airline revenues for the domestic mail volume.

CAB estimated that the rate structure proposed for the local lines will produce an average yield of \$1.35 per ton-mile-mile compared to the current average of \$1.35.

The proposed rate will consist of a base rate charge of 50.17 cents per mail ton-mile plus a terminal charge per pound of mail explained ranging from \$1.32 cents to \$1.35 cents varying by class of service.

Annual total carrier mail fees for the local service industry under the mail structure will be approximately \$833,000.

This is a reflection of \$237,000 from \$1.14 billion in service mail per year prior to rate changes.

CAB estimated that the rate structure proposed for the 13 local carriers will save the Post Office \$237,000 for the period July 1, 1955 through Sept. 30, 1955.

The mail compensation fee each carrier will receive after Oct. 1 will be paid monthly after comparing the sum of the base rate charges and the terminal charges.

Therefore, the Board's estimated total per year formula will remain unchanged. Major changes will be necessitated by route adjustments and an input change and in some cases an arbitrary application of a terminal rate. A new input service will require a minimum of postage and a corresponding change in the base-rate charges.

Any nation that is not specifically classified in the Board will automatically fall under the maximum rate of 5.96 cents per pound.

### Mail Rates

Carrier	Estimated Yield per Mail Ton-Mile
Airline	134.20 Cents
Braniff	97.16
Central	106.94
Foothills	79.78
Long Island	176.40
Makana	300.46
North Central	161.65
Orca	124.69
Piedmont	91.31
Southern	99.14
Southwest	121.23
Trans World	87.05
West Coast	121.96
Average	104.75 Cents



## Frye Short Takeoff Transport Ready to Leave Drawing Board

The Frye F. 1 large-capacity, low-engine-horsepower transport being tailored at a "DC-3 replacement" is taking on final drawing-board form while its owners search for a contractor to manufacture the aircraft and, as importantly, for future customers.

Recent wind tunnel tests are being conducted at the University of Wichita to work out the best possible seat configuration and packaging envelope. It is intended to have a crew of two flying. Commercial, the newly-formed Frye Corp. in Fort Worth, Tex., is receiving inquiries from both foreign-the Far East possible, will be made to a Far Eastern airline-and U.S. local-service carriers.

Jack Foy, company head and former Trans World Airlines president, said: "We think that the best designs are following the project closely. This plane is going to win all of those others and others will not be standard configuration for the F. 1 for production."

The company is prepared to offer the new aircraft to the airline services and to all other kinds of Foy said.

At present, the company has placed a \$150,000 price tag on the F. 1.

### Contract Protection

The photograph of a model (above) depicts an early version of the F. 1. A more accurate configuration gives the airplane a slanted fuselage and, unfortunately, a nose resembling a flying boat bow to ease cargo loading. The cockpit also has been moved forward for better visibility. The landing gear will have a single main strut running down from the inboard engine nacelle and connecting with struts springing out from the lower wing fairings.

Frye Corp. expects to start construction of a prototype as soon as it can locate facilities close to its present offices at 617 Main St., Ft. Worth.

The plan goes no place to engineering and development, with F. 1 production restricted to an outside contractor. Frye explained that the new firm does

not want to deplete both capital and time through the building manufacturing facilities when there is considerable production capability available as a result of that country's natural buildup.

He reported that negotiations have been under way for more than with a number of aircraft manufacturing facilities but that no final decision has been made. The supplier will be produced under a one-year lease, he said, with options available for purchasing and amending the plan.

The F. 1 now also be produced in Europe and possibly Latin America, as the company's own facilities, or arrangement with an existing manufacturer or by license. Frye said that the firm is now choosing the possibility with firms in two European countries.

Easy, predominantly, assembly and maintenance will be facilitated in the place, with all major structures designed to operate without modification for 50,000 flying hours and 15 years, each year. The aircraft will be built in the United States, in Frye's right-hand master, Kurt H. Wolf, who signed contracts on the design of the original Fairchild HI-92 and more recently operated a HI-92 airline in the Middle East before moving to the U.S.

Wolf's main job has been and is to workshop the F. 1's design and production as it relates to single. Only conventional materials will be used.

A number of equipment manufacturers have been called on to develop components for the F. 1. These leading gear manufacturers are working out designs on a competitive basis.

### Short-Field Flying

The Frye F. 1 is not designed for land or speed-of-sound journeys but to make facilities close to its present offices at 617 Main St., Ft. Worth.

The plan goes no place to engineering and development, with F. 1 production restricted to an outside contractor. Frye explained that the new firm does



a minimum. Frye emphasized that the F. 1 is not intended to be competitive to established mass-produced DC-3 airplanes, such as the Lockheed Super Constellation, which features a pressurized cabin, reinforced landing gear and a 200 mph cruise speed on 60% power.

"In fact," he said, "we have told some potential customers that they would be better off if they took a look at the Bemis, because we feel it will

set them better than the F. 1."

Frye said he feels that the basic F. 1 has considerable design "shortfall" so that further performance gains can be had at a later date. The company has been evaluating a number of horsepower improvements in the 500-hp class he said, which will give the F. 1 a range over 1,000 miles and a top speed of 185 mph. The current engines are a 50-ft. obstacle to about 600 ft. Bemis' been tested in an other possible under study.

Apparently no final decision has been made on a water-based version. Wolf says that the F. 1's operating costs will be so low that an operator would be better off having the necessary air strips rather than putting up expensive dams. Wolf indicated that he would rather go to hydroplane landing gear than conventional float arrangements.

### Frye's Structure

Frye Corp., organized some six weeks ago, has a punch leased shop, in addition to Jack Foy and Kurt Wolf, two free consultants.

Coy W. Vough, former president of Carter-Wright Corp., Robert Haase, of Robert Haase Associates, a Cleveland industrial engineer, and consulting firms, A. William Morris III, partner in Morris Reale Co., George City, Ill., John D. McEachron, Dallas, Tex., and Fred S. Bass and Francis E. McElroy, both of Ft. Worth.

The chief engineer is William Ben

son, formerly of McDonald Aircraft Co. Other associates include Capt. D. W. Franklin IV, USN, ret., former TWA vice president of planning and research, and member of the Board of Airlift; Capt. William S. Dahl (USN, ret.) specialist in engine design and research and applied aerodynamics; and Dr. J. M. Franklin, aircraft structural specialist.

Approach control then added if the flight would be able to make an approach to Runway 4 using the back course of the Instrument Landing System. The flight reported that it had discontinued the approach and was instead using approach instructions and returned to the holding pattern. Shortly thereafter the weather conditions again were below the minimum.

Approach control then added if the flight would be able to make an approach to Runway 4 using the back course of the Instrument Landing System. The flight was cleared to descend and continued its approach and then cleared to land on the back ground and turn around. The flight then approached a ground control approach, which it turned and returned to the holding pattern again.

The flight was again cleared for an



**NEW YORK'S \$3-MILLION** West Side Airport Terminal opened this month, offering relief for New York-bound passengers who formerly left by bus from the East Side Terminal only to find themselves caught in traffic jams that sometimes required up to an hour to negotiate. New buses daily shuttle into Lincoln Tunnel.



At present, the auxiliary building houses the facilities of seven U.S. airlines—American, American, Eastern, Midwest, National, United and Trans World. Northwest Orient is scheduled to move in the near future. The building itself is located between Third and Dyre Avenues with an easy entrance on Third St.

## Erratic Approach Blamed in Crash

Possible cause of the crash of a Learjet 23A (N426) near West Side Airport Dec. 18, 1954 was erratic approach, which resulted in a collision with terrain too low to allow avoidance of obstacles, which apparently forced the left wing of slope to support light. The approach was 80% of the normal, and the commander disclosed an instance of fatigue causing delayed initiation of roll-out corrections.

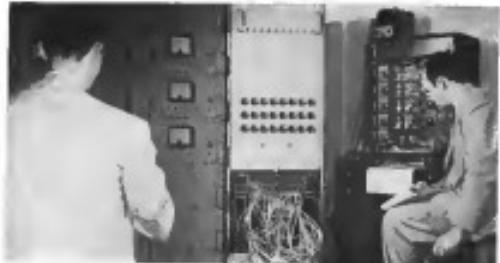
The report stated: During the Board's investigation and analysis of this accident, much consideration was given the possible misinterpretation of the approach lights or an obstacle associated with them. Evidence regarding misinterpretation of lights would be primarily the testimony of the crew. This was not available for consideration, but the crew were being firmly informed that lights do not indicate the landing maximum of 480 ft. and the flight continued to land.

Weather conditions imposed and the flight was cleared for an approach to Runway 4 using the back course of the Instrument Landing System. The flight reported that it had discontinued the approach and was instead using approach instructions and returned to the holding pattern. Shortly thereafter the weather conditions again were below the minimum.

The approach control then added if the flight would be able to make an approach to Runway 4 using the back course of the Instrument Landing System. The flight was cleared to descend and continued its approach and then cleared to land on the back ground and turn around. The flight then approached a ground control approach, which it turned and returned to the holding pattern again.

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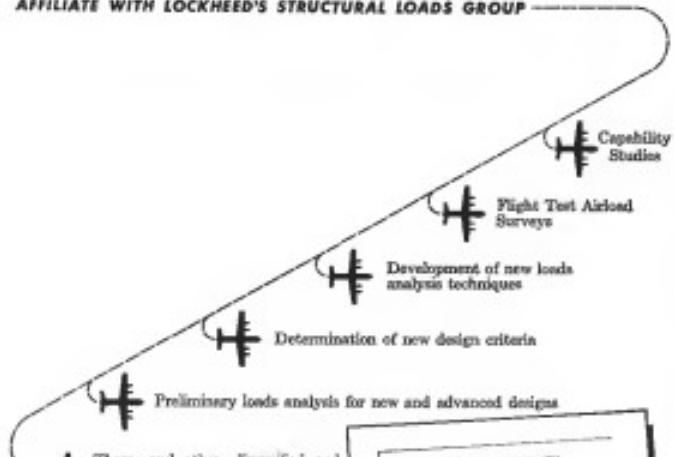




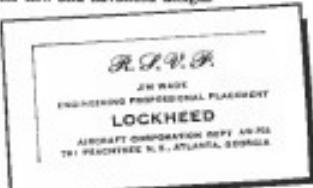
These Engineers are discussing the results of a simulated dynamic maneuver as calculated by an EASE analog computer.

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The logo for Marquardt Aircraft Co. consists of the company name "marquardt" in a lowercase, bold, sans-serif font. To the right of the name is a stylized graphic of a globe showing continents. Above the globe, the word "AIRCRAFT CO." is written in a smaller, all-caps, sans-serif font. Below the globe, there is a horizontal arrow pointing to the right.

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## EDITORIAL

Management Challenge

Admiral Arthur W. Radford, chairman of the Joint Chiefs of Staff, is the latest top American official to warn of the increasing gravity of our technological race with Russia in the developing area of weapons (see page 18). The increasing pressure of this race is evident in the changing patterns of research, development and procurement of armament systems reported in recent issues of AVIATION WEEK. The military is making increasing demands on the aviation industry and its supporting structure to develop equipment faster, produce it cheaper and deliver it sooner.

Segmental operations in this newly evolving development and procurement system pose new and tougher challenges to the management of surface, logistic, atomic and composite manufacturing firms. For the large industrial groups in the weapon business, the task of weapon systems manager will provide a new dimension to success or failure. For the sub-system and component manufacturers, heavy emphasis on development and user relations with the weapon systems manager will impose heavy loads.

Competition is getting stiffer with better rewards for the successful and lean pickings for those organizations that lag in deployment in producing performance

There is going to be increased pressure from the military to promote industry to invest larger portions of its profits in research and development facilities and efforts to push the state of the art ahead at a much faster pace.

There is going to be less waiting along of technically troubled production programs and more hand-holed wiping out of products that don't fulfill a manufacturer's promise.

There are going to be major shifts in the financial functions of individual companies, depending on how well they adjust to the changing patterns.

In the face of a wide variety of pressures from the military customers our industry must develop a strong independent voice of its own, capable of exerting effective counter pressure against expansionist and restrictive government policies. Unless the industry develops

Never before has management of the aviation industry faced such a difficult challenge. Never before has it had a better opportunity to serve the interests of that industry better.

### Keep the Sabre Knights

An Air Force team has made a grave mistake in disbanding its Silver Knight jet acrobatic team from the 325th Fighter Interceptor Squadron at Hamilton AFB. Calif. Apparently USAF feels that one jet acrobatic team is sufficient to represent it publicly and has picked the Thunderbirds as its official stent group. We strongly disagree with this policy.

USAF both needs public support not only generally for its entire program but also specifically from the south of the state from whom it must draw its flying pilots, air crews, missile technicians and all of the high grade human skills that it takes to turn weapons and manpower into a top notch fighting force.

Jet aeronautic education conducted with the precision, skill and safety that have characterized the operations of the Solar Knights, Thunderbirds and the Navy's Blue Angels are a dramatic method of strong public interest in general and the specific interest of young men in their country's manpower. USAF needs more jet aeronautics teams, not less. It should reverse the short-sighted policy and reorganize the Solar Knights.

British Misinformation Service

Here is a brief gen of aeronautical non-fiction just received from the British Information Service, an official agency of the British government. In press sheet bulletin P-8291 dated Sept. 20, 1955 and marked for the attention of aviation writers this official press corps agency says:

"British Engine as World Speed Record One of Several Made Under License in the United States"

This release goes on to "reinforce" aviation written as follows: "The USAF Super Sabre's magnificence lies in being an average of 822 mph to gain the world speed record is achieving considerable satisfaction to British aircraft manufacturers."

that are also clearly marking each other that the F 104C engine is the famous British Sapphire made under license in the United States by Pratt & Whitney at the JTF and by Curtis Wright at the JFS.<sup>11</sup>

This would go on to "inform" aviation writers that the Bristol Observor "developed to produce 15,000 T-hrs" and is also being made by Pratt & Whitney at the 1971."

At U.S. aviation writers and British aircraft manufacturers knew the J77 engine was really an Armstrong product designed, developed and built by Pratt & Whitney Aircraft. The only license involved in the J77 is that issued by Pratt & Whitney to the Farnell Aircraft Engine Division in Cleckheaton to augment production to meet the tremendous USAF and Navy demand for the fighter. U.S. aviation writers and British aircraft manufacturers also knew that the design idea was the British Gloster who had licensed it to Curtiss Wright, not Pratt & Whitney, for development of the J77 fighter.

British covert operations must also be "there fully revealing each other" so that this type of misinformation plotted abroad by an official British government agency does them considerable harm. Their "natural phasers at the sevens of a friend" must be triggered by the conviction that they need a new existence within the British Information Service.



## **NEW POWER SOURCE TIGHTENS RADAR DEFENSES**

Wilson-Wall Kynstrom Acid Detectors

What is the significance of the headline above? To borrow from an old baseball expression, "You can't hit 'em if you can't see 'em"—approaching planes that formerly evaded radar detection can now be "seen" at greater distances, than ever

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